

Revisions in paleotropical Vernonieae (Asteraceae)

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Abstract.—The paleotropical subtribes Erlangeinae, Centrapalinae and Gymnantheminae are described as new. Fourteen paleotropical genera are described, raised from lower rank, resurrected, enlarged or reduced with 110 new combinations. *Cabobanthus* (2 spp.), *Hilliardiella* (8 spp.), *Orbivestus* (4 spp.), *Vernoniastrum* (8 spp.), *Koyamasia* (1 sp.), *Brenandendron* (3 spp.), *Myan-maria* (1 sp.) and *Manyonia* (1 sp.) are described as new. *Ocephala* (S. B. Jones) H. Rob. (2 spp.) and *Lampropappus* (O. Hoffm.) H. Rob. (3 spp.) are elevated to generic rank. Four genera are resurrected, the Asian *Acilepis* D. Don with 9 of 10 species newly combined, the African *Bechium* DC. (2 spp.), *Centrapalus* Cass. (9 spp.), *Linzia* Sch. Bip. ex Walp. with 5 of 7 species newly transferred, and *Polydora* Fenzl (8 spp.). One species is transferred to make a total of 27 in *Distephanus*, 4 species are transferred to total 7 in *Cyanthillium*, and 39 species are transferred to total 43 in *Gymnanthemum*. *Lamprachaenium* Benth. is synonymized with *Phyllocephalum* Blume with 1 species transferred.

The present paper provides a limited re-organization of the Eastern Hemisphere Vernonieae for purposes of a projected generic review of the tribe. The need to summarize the whole tribe presents a special problem. The half of the tribe in the Western Hemisphere has been rather well delimited into workable and phyletically acceptable genera (Robinson 1996). This includes an accurate delimitation of the type genus *Vernonia* Schreb. that is primarily found in eastern North America. The Eastern Hemisphere members of the tribe have thus been left in a particularly untenable position, with an excessively paraphyletic core genus and mostly paraphyletic or polyphyletic segregates, none of which are congeneric *Vernonia*. In fact, none of the existing subtribal names in the Vernonieae are applicable to the large elements that are endemic to the Eastern Hemisphere.

At the time of the summary of the New World Vernonieae (Robinson 1966), only a few Eastern Hemisphere elements have been revised by the author. The name *Bac-*

charoides was resurrected for the members of the *Stengelia* Group as early as Robinson et al. (1980), and transfers were made into *Baccharoides* and *Cyanthillium* (Robinson, 1990) mostly to accommodate species adventive in the Western Hemisphere. *Distephanus* was resurrected and partially revised as a last step in the removal of some of its species from the tribe Senecioneae (Robinson & Kahn 1986). In the latter study the opportunity was taken to provide the proper combination for the type species of *Gymnanthemum* Cass. that had originally been named as a *Eupatorium*. Nevertheless, no further work was planned in the Eastern Hemisphere members of the Vernonieae as recently as the time of the publication of the preliminary Western Hemisphere revision in the Kew International Compositae Conference volume (Robinson 1996).

The present study has built upon the reference works of many other authors. Humbert (1960), Wild (1977, 1978), Wild & Pope (1978a, 1978b), Jeffrey (1988), which cover all the genera of the tribe in various

parts of Africa, have proven most useful in the present study. The study of Jones (1981), restricted to *Vernonia* sensu lato, and Lisowski (1992) that excludes *Vernonia*, have been less useful. The works of Kirkman (1981), Pope (1983), Koyama (1984), Isawumi (1993, 1995), and Isawumi et al. (1996) have added important information. The present study has used the summary of secondary metabolite chemistry of the Vernoniae by Bohlmann and Jakupovic (1990) and the various reports of chromosome numbers by Jones (1974, 1979, 1982). DNA studies are as yet limited to those mentioned by Keeley (1994, 1995) and Kim et al. (1996). The final conclusions of the present study are, nevertheless, ultimately based on examination of specimens in the United States National Herbarium (US) and on some specimens kindly sent on loan by Kew (K), British Museum (BM), Bruxelles (BR) and Paris (P).

Jones (1977, 1981) noted basic differences between the Vernoniae in the Eastern and Western Hemispheres, and this has been generally accepted by others such as Jeffrey (1988). These differences have been reviewed to some extent by Isawumi (1995). The Hemispheric trends noticed by Jones (1977) are in the chromosome numbers and chemistry. The Western Hemisphere species usually have a chromosome number of $N = 17$, and the Eastern Hemisphere species have mostly $N = 9$ or 10 . The chemicals cited were terpenoids and flavonoids. Jones (1981) also stated that triporate pollen grains were known only from the Eastern Hemisphere. Since that time, some examples of triporate grains have been found in Latin America, *Acilepidopsis* (Robinson 1989), *Mesanthophora* (Robinson 1992a), *Pacourina* (Robinson 1992b), but at least the first two of these are considered to be related to Eastern Hemisphere members of the tribe. Robinson and Kahn (1986) and Isawumi et al. (1996) briefly noted the apparent restriction of glandular dots on the anthers and their appendages to New World members of the Vernoniae. In

the present study, the raphids of the achene wall in the Eastern Hemisphere species have proven to be predominantly elongate, with only a few entities such as *Gutenbergia* having characteristically subquadrate or short raphids. Most groups of Western Hemisphere Vernoniae have characteristically subquadrate raphids. In their chemical survey, Bohlmann and Jakupovic (1990) found the distinctive 5-alkyl coumarins only in Eastern Hemisphere genera and species, groups that are all placed in this study in the new subtribe Erlangeinae.

Inflorescences with scorpioid or well developed seriate cymes in the Vernoniae seem almost entirely restricted to the New World and New World genera like *Struchium* that have become Pantropical. A notable exception, *Manyonia*, described below as a new genus from East Africa, is considered to be a relative of New World genera, and it is described in the subtribe Vernoniinae.

Some doubts about the hemispheric differences were expressed by Keeley and Turner (1990). They mention some cases of Western Hemisphere "*Vernonia*" with chromosome numbers of $N = 10$ or 12 , and they call attention to similarities between the groups referred to by the present author as Piptocarphinae in the Americas and the Gymnantheminae in the Eastern Hemisphere. The latter groups both tend to be woody, often have deciduous inner involucre bracts and usually have blunt-tipped sweeping hairs on their styles. Nevertheless, the possible relationship is considered here to be above the generic and subtribal levels. The doubts of Keeley & Turner (1990) are justified to the extent that *Vernonia* cannot be simply divided into two genera, one for each Hemisphere. Many segregates are needed for each hemisphere.

There is an important limitation to the use of pollen structure as a phyletic characteristic in the Vernoniae, a limitation already seen in both Western and Eastern Hemisphere members of the tribe (Robinson 1996). First, the simple non-lophate or

sublophate pollen, Type A, often considered primitive in the tribe, was not considered primitive by the present author (Robinson 1996). Second, some pollen variations are of more importance than others. Differences between various lophate patterns seem to correlate well with other characters, but all groups seem able to revert erratically to non-lophate or sublophate forms, the Type A of Jones (1981). The truly triplicate forms, with irregularly organized polar lacunae, are evidently not closely related to other lophate types with distinct colpi. However, they may be very closely related to colpate forms that are non-lophate. This does not mean that the difference between triplicate and non-lophate triplicate cannot be used as a key character when the character happens to correlate with other features, as in *Cyanthillium*.

The present study has been restricted by available time and specimens. The new subtribes are kept to a minimum, although that minimum seems to fit the Paleotropical material rather well. The new genera and taxa elevated to generic rank are those that seem inescapable, and no attempt is made here to dispose of some additional distinctive elements in the Eastern Hemisphere that do not fit in the genera presently recognized. Possibly, some smaller distinctive elements have been completely missed in the present survey. The number of species transferred into the various segregate genera is necessarily incomplete, but proper names are now available for many species that should not be retained in *Vernonia*. It is hoped that other authors will continue the process of making transfers. An attempt has been made to avoid overly broadening the concepts of the segregate genera. Even so, *Gymnanthemum* has been interpreted to include many elements that differ from the type by corolla lobe, style and achene characters. This has been done with the conviction that the broader concept of that genus will prevail.

The synonymy given for most of the African species follows Jeffrey (1988).

New Subtribes of the Eastern Hemisphere Vernonieae

All presently named subtribes of the Vernonieae are based on primarily Western Hemisphere groups. None of these subtribal names apply to the primarily Eastern Hemisphere groups. To rectify this situation, the following three new subtribes are named.

Erlangeinae H. Rob., subtribus nov. Type: *Erlangea* Sch. Bip., Flora 36:34. 1853. Type: *E. plumosa* Sch. Bip.

Vernonia sect. *Tephrodes* DC. Prodr. 5: 24. 1836. Type: *Conyza cinerea* L.

Bechium DC., 5:70. 1836. Type: *B. scapiforme* DC.

Vernonia sect. *Lepidella* Oliver & Hiern, Fl. Trop. Afr. 3:267. 1877. Type: *Vernonia petersii* Oliver & Hiern.

Vernonia subg. *Orbisvestus* S. B. Jones, Rhodora 83:60. 1981. Type: *Vernonia karaguensis* Oliver & Hiern.

Vernonia sect. *Orbisvestus* S. B. Jones, Rhodora 83:61. 1981. Type: as above.

Vernonia subsect. *Orbisvestus* S. B. Jones, Rhodora 83:61. 1981. Type: as above.

Vernonia subsect. *Hilliardiana* S. B. Jones, Rhodora 83:66. 1981. Type: *Webbia oligocephala* DC.

Vernonia subsect. *Tephrodes* (DC.) S. B. Jones, Rhodora 83:70. 1981.

Vernonia subsect. *Lepidella* (Oliver & Hiern) S. B. Jones, Rhodora 83:72. 1981.

Vernonia subsect. *Oocephalae* S. B. Jones, Rhodora 83:72. 1981. Type: *Vernonia oocephala* Baker

Vernonia subsect. *Bechium* (DC.) S. B. Jones, Rhodora 83:73. 1981.

Plantae herbaceae annuae aut perennes vel frutescentes, pilis saepe symmetriciter T-formibus. Folia alterna vel opposita vel ternata pinnatinervata. Receptaculum epaleaceum vel raro paleaceum. Flores 3 vel ca. 100 in capitulo; corollae lavandulae vel purpureae; thecae antherarum base non vel tenuiter caudatae; appendices apicales gla-

brae in parietibus cellularum tenues raro tenuiter ornatae; base stylorum noduliferi; rami stylorum aciculiformiter papilloso. Achenis 4–6 vel 8–10 costata; raphidis plerumque elongatis raro subquadratis; carpodia anguste cylindrica; pappus longe setiformis vel abbreviatus vel coroniformis saepe facile deciduus. Grana pollinis non lophata et tricolporata vel lophata et triporata in formibus lophatis lacunis polaribus irregularibter dispositis, tectis micropunctatis vel emicropunctatis. Numerus chromosomatum $N = 9, 10, 20$.

The name is chosen to conform with the already established term “Erlangeoid” (Pope 1983). The subtribe is circumscribed to include all the Vernoniae presently known with triporate pollen (excluding *Pacourina* Aubl., Robinson 1992b) or 5-alkyl coumarins (Bohlmann & Jakupovic 1990). The unquestioned core of the subtribe includes genera with only 4–5 angled achenes and herbaceous habits, but, at present, additional forms with 10-ribbed achenes and woody habits are also included. All the included genera have acicular sweeping hairs of the style. The genera included are the New World *Acilepidopsis* H. Rob. (1989) and *Mesanthophora* H. Rob. (1992a), and Old World *Acilepis* D. Don, *Ageratinastrum* Mattf., *Ambassa* Steetz, *Bechium* DC., *Bothriocline* Oliv. ex Benth., *Brachythrix* Wild & G. V. Pope, *Cyanthillium* Blume, *Decastylocarpus* Humbert, *Dewildemanina* O. Hoffm., *Diaphractanthus* Humbert, *Erlangea* Sch. Bip., *Ethulia* L. f., *Gossweilera* S. Moore, *Gutenbergia* Sch. Bip. ex Walp., *Hystrichophora* Mattf., *Iodocephalus* Thorel ex Gagnep., *Kinghamia* C. Jeffrey, *Lamprachaenium* Benth., *Msuata* O. Hoffm., *Phyllocephalum* Blume, *Omphalopappus* O. Hoffm., *Rastrophyllum* Wild & G. V. Pope, and six genera newly named or elevated below.

Centrapalinae H. Rob., subtribus nov.

Type: *Centrapalus* Cass., Dict. Sci. Nat. ed. 2, 7:382. 1817. Type: *Centrapalus galamensis* Cass.

Vernonia subsect. *Stengelina* Sch. Bip. ex Walp., Repert. Bot. Syst. 2 [Suppl. 1]: 946. 1843. Type: *Vernonia adoensis* Sch. Bip. ex Walp.

Vernonia sect. *Stengelina* (Sch. Bip. ex Walp.) Benth. & Hook. f., Gen. Pl. 2: 227. 1873.

Vernonia subsect. *Centrapalus* (Cass.) S. B. Jones, Rhodora 83:69. 1981.

Vernonia sect. *Azureae* S. B. Jones, Rhodora 83:74. 1981. Type: *Vernonia glabra* Vatke.

Plantae herbaceae perennes vel raro annuae, pilis simplicibus multiseptatis vel asymmetriciter T-formibus vel nullis. Folia alterna pinnatinervata vel longitudinaliter nervata. Bractee involucri apice saepe appendiculatae vel plerumque herbaceae. Flores numerosi in capitulo; corolla purpurea vel azurea; thecae antherarum base rotundatae; appendices apicales glabrae vel raro papilliferae in parietibus cellularum leniter incrassatae; base stylorum noduliferi vel non noduliferi; rami stylorum acute papilliferi. Achenis 10-costata, raphidis elongatis vel interdum subquadratis; pappus plerumque setiformis. Grana pollinis tricolporata lophata vel non lophata micropunctata vel non micropunctata in formibus lophatis lacunis polaribus solitariis interdum praesentibus. Numerus chromosomatum $N = 9, 10$.

The subtribe is typified by *Centrapalus* Cass., and includes *Adenoon* Dalz., *Aedesia* O. Hoffm., *Baccharoides* Moench, *Camchaya* Gagnep., *Lachnorhiza* A. Rich., *Linzia* Sch. Bip. ex Walp., *Muschleria* S. Moore, *Neurolakis* Mattf. and *Pleurocarpaea* Benth. The sesquiterpene constituents include elemanolides (Bohlmann & Jakupovic 1990).

The genera of the subtribe are herbaceous or weakly shrubby, and the sweeping hairs of the styles are acicular. The subtribe includes elements with the distinctive *Linzia*-type pollen cited by Jeffrey (1988) such as *Linzia* and *Aedesia* and one with polar lacunae on its pollen grains and a lack of

basal styler nodes like *Baccharoides* (Isawumi 1993; Isawumi et al. 1996).

Gymnantheminae H. Rob., subtribus nov.

Type: *Gymnanthemum* Cass., Bull. Soc. Philom. Paris 1817:10. 1817. Type: *Gymnanthemum cupulare* Cass. [= *G. coloratum* (Willd.) H. Rob. & B. Kahn].

Distephanus Cass., Bull. Soc. Philom. Paris 1817:151. 1817. Type: *Distephanus populifolius* (Lam.) Cass.

Vernonia sect. *Strobocalyx* Blume ex DC., Prodr. 5:21. 1836. Type: *Vernonia arborea* Buch.-Ham.

Gongrothamnus Steetz in Peters., Reise Mossamb. Bot. 336. 1864. Type: *G. divaricatus* Steetz in Peters

Vernonia sect. *Distephanus* (Cass.) Benth. & Hook. f., Gen. pl. 2:228. 1873.

Vernonia sect. *Lampropappus* O. Hoffm., Bol. Soc. Broter. 13:14. 1896. Type: *Vernonia lampropappa* O. Hoffm.

Vernonia subsect. *Strobocalyx* (Bl. ex DC.) S. B. Jones, Rhodora 83:64. 1981.

Vernonia subsect. *Gongrothamnus* (Steetz) S. B. Jones, Rhodora 83:65. 1981.

Vernonia subsect. *Pawekianae* S. B. Jones, Rhodora 83:66. 1981. Type: *Vernonia angulifolia* DC.

Vernonia subsect. *Urceolatae* S. B. Jones, Rhodora 83:67. 1981. Type: *Vernonia sphaerocalyx* O. Hoffm.

Vernonia subsect. *Turbinella* S. B. Jones, Rhodora 83:67. 1981. Type: *Vernonia lampropappa* O. Hoffm.

Vernonia subsect. *Distephanus* (Cass.) S. B. Jones, Rhodora 83:68. 1981.

Vernonia subsect. *Glutinosae* S. B. Jones, Rhodora 83:73. 1981. Type: *Vernonia glutinosa* DC.

Plantae fruticosae vel arborescentes vel scandentes, pilus simplicibus et arachnoid-eis vel L-formibus vel T-formibus. Folia alterna pinnatinervata vel trinervata. Bractae involucri 20–70 in seriebus 2–7 plerumque gradatae interiores interdum deciduae; re-

ceptacula epaleacea vel paleacea. Flores 1–40 (–75) in capitulo; corollae lavandulae vel roseae vel flavae, lobis plerumque erectis et longe triangularibus rariter elongatis et arcte revolutis; thecae antherarum base plerumque valde caudatae; appendices apicales induratae et glabrae in parietibus cellularum aliquantum ornate incrassatae; basi stylorum non noduliferi vel noduliferi interdum abrupte noduliferi; rami stylorum plerumque obtuse papilliferi. Achenia 5 aut 10–12-costata, raphidis plerumque elongatis interdum subquadratis vel nullis, carpodia lata; pappus plerumque setiformis, Grana pollinis tricolporata non lophata vel sublophata vel raro lophata in formibus lophatis lacunis polaribus solitariis nullis; tectis micropunctatis. Numerus chromosomatum $N = 10$, $2N = 30$.

The subtribe is typified by the genus *Gymnanthemum* Cass., but it also includes *Distephanus* Cass., *Centauroopsis* Boj. in DC., *Oliganthes* Cass., and three genera named or elevated below. The sesquiterpene lactone constituents include elemnolides (Bohlmann & Jakupovic 1990).

The subtribe includes all of the true large shrub and tree Vernoniaceae in the Eastern Hemisphere. The sweeping hairs of the styles often have rather blunt tips. Inner involucre bracts are persistent or deciduous, and a few species of *Gymnanthemum* and *Brenandendron* have long coiled corolla lobes. These characteristics are generally shared by the Gymnantheminae and the American Piptocarphinae, but deciduous bracts and reflexed corolla lobes are much more consistently present and blunt sweeping hair much less consistently present, in the Piptocarphinae. The Gymnantheminae lack stellate hairs like those common in the Piptocarphinae.

New Genera and New Combinations of
Eastern Hemisphere Vernoniaceae
Subtribe Vernoniinae

Manyonia H. Rob., gen. nov. (Vernoniinae).

Type: *Vernonia peculiaris* Verdc.

Plantae herbaceae perennes ad 1 m altae; caules brunnescentes striati sparce hispiduli, pilis simplicibus multiseptatis uniseriatis, internodis 4–6 cm longis. Folia alterna, petiolis 8–10 mm longis; laminae membranaceae ovatae 8–11 cm longae 3.2–5.0 cm latae base anguste cuneatae margine biserratae apice plusminusve acuminatae supra sparce pilosae subtus dense glandulo-punctatae, nervis secundariis utrinque 5 vel 6 supra et subtus puberulis. Inflorescentiae seriate cymosae, ramis ad 14 cm longis, pedunculis plerumque brevibus 2–3 (–15) mm longis dense puberulis. Capitula campanulata 6 mm alta et lata; bracteae involucri ca. 100; seriebus exterioribus 3–4 patentes longe subulatae 2.5 mm longae base dilatatae 0.1–0.2 mm latae inferne margine puberulae; bracteae intermediae oblongae 4 mm longae apice longe aristatae; bracteae interiores anguste oblongae 5 mm longae et 2 mm latae apice acuminatae; receptaculum glabrum in diametro ca. 1.8 mm. Flores ca. 35 in capitulo; corollae lilacinae ca. 5.5 mm longae, tubis angustis ca. 2.5 mm longis superne infundibularibus, faucibus ampliatis ca. 1 mm longis, lobis oblongis ca. 1.5 mm longis et 0.3 mm latis extus glanduliferis; thecae antherarum ca. 2 mm longae base non caudatae; appendices apicales ca. 0.4 mm longae in parietibus cellularum tenues glabrae; basi stylorum disciformiter nodati; rami stylorum in papillis aciculiformibus obsiti. Achenia oblonga 1.5 mm longa 5-costata inter costam breviter setulifera et longitudinaliter multiseriate idioblastifera, costis glabris prominentibus et induratis, raphidis perdense dispositis subquadratis vel polygonatis; setae pappi ca. 20 barbellatae ca. 4 mm longae; squamulae exteriores ca. 25 minute ciliatae. Grana pollinis in diametro ca. 35 μ sublophata tricolporata.

The genus *Manyonia* has been considered by the author as a relative of New World Vernoniae since he first saw the illustration of the seriate cymes accompanying the original description (Verdcourt

1956). This structure, otherwise lacking in native Old World Vernoniae, is confirmed in material borrowed from The Royal Botanic Gardens, Kew. This relationship seems confirmed by a poorly researched characteristic, the type of ornamentation of the endothelial cells of the anther. The cells in *Manyonia* have rather strong thickenings, longitudinal in some cell rows, and in other rows, arching across the lower end. This is a pattern seen in many Western Hemisphere Vernoniae. Eastern Hemisphere Vernoniae have weaker ornate thickenings if any. Further examination of specimens of *Manyonia* shows a strong resemblance to New World genera such as *Heterocypsela* H. Rob. and *Dipterocypsela* S. F. Blake, especially in the wall of the achene with extremely crowded subquadrate or polygonal raphids. The new genus differs from *Heterocypsela* and *Dipterocypsela* in lacking the heteromorphic achenes and the glanduliferous anther appendages of its American relatives. The pollen of *Manyonia* is sublophate, more like *Dipterocypsela* and unlike the lophate form in *Heterocypsela*.

The generic name is derived from the vernacular name Manyoni cited on Burt 5119 (K). The needed combination is as follows:

Manyonia peculiaris (Verdc.) H. Rob., comb. nov. basionym: *Vernonia peculiaris* Verdc., Kew Bull. 1956:447. 1956. Tanzania.

New Genera and New Combinations of
Eastern Hemisphere Vernoniae
Subtribe Erlangeinae H. Rob.

Acilepis D. Don, Prodr. Fl. Nepal. 169. 1825. Type: *Acilepis squarrosa* D. Don.

Lysistemma Steetz in Peters, Reise Mosamb. Bot. 340. 1864. Type: *Lysistemma dendigulense* (DC.) Steetz.

Xipholepis Steetz in Peters, Reise Mosamb. Bot. 344. 1864. Type: *Xipholepis silhetensis* Steetz.

Vernonia sect. *Xipholepis* (Steetz) Benth. & Hook.f., Gen. pl. 2:229. 1873.

Erect perennial herbs; stems pentangular, with hairs multiseptate at base and often with long subfusiform apical cell. Leaves alternate, obovate to oblong-ovate. Inflorescences of single heads, spiciform cymes, or corymbose cymes with few to many heads. Involucres funnellform to campanulate; bracts 50–200 in 6–12 series, persistent, apiculate to subacute; receptacle epaleaceous. Heads with 25–80 florets; corollas lavender, tubes slender below, funnellform above into throat, throat half or less as long as anther thecae, lobes long and narrow, with glandular dots; anther bases blunt, not tailed; apical anther appendages glabrous, with thin-walled cells; style base with node, style branches with acicular sweeping hairs. Achenes 8–10 ribbed, setulae with one cell long, other cell short, raphids oblong with rhomboid tips; pappus whitish, both series rather easily deciduous, with many barbellate inner setae, outer setae shorter, scarcely broader. Pollen triporate, lophate, nearly psilate, emicropunctate, with ca. 20 lacunae.

The Asiatic *Acilepis* is distinct in the rather simple stem hairs, the pedunculate or separated heads, the triporate pollen and in such details as the often totally deciduous pappus and the highly unequal cells of the setulae of the achene. Jeffrey (1988) recognized the group for an African species, *Vernonia polysphaera*, treated below as the new genus *Cabobanthus*. The latter has basal tubers, sessile clustered heads, a more persistent pappus and the cells of the setulae of equal length.

The following ten species are recognized in the genus:

Acilepis aspera (Buch.-Ham.) H. Rob., comb. nov. basionym: *Vernonia aspera* Buch.-Ham., Trans. Linn. Soc. London 14:219. 1824.

Eupatorium pyramidale D. Don, Prodr. Fl. Nepal. 170. 1825.

Vernonia roxburgii Less., Linnaea 6:674. 1831.

Xipholepis aspera (Buch.-Ham.) Steetz in

Peters, Reise Mossamb. Bot. 345. 1864.

Vernonia pyramidalis (D. Don) Mitra, Ind. For. 99:100. 1973. China, India, Myanmar, Nepal, Thailand.

Acilepis clivorum (Hance) H. Rob., comb. nov. basionym: *Vernonia clivorum* Hance, J. Bot. 7:164. 1869.

Aster coriaceiformis H. Lév. & Vaniot, Rept. Spec. Nov. Regni Veg. 8:358. 1910. China.

Acilepis dalzelliana (J. R. Drumm. & Hutch.) H. Rob., comb. nov. basionym: *Vernonia dalzelliana* J. R. Drumm. & Hutch., Kew Bull. 1909:261. 1909. India.

Acilepis dendigulensis (DC.) H. Rob., comb. nov. basionym: *Decaneurum dendigulense* DC. in Wight, Contr. Bot. Ind. 7. 1834, not *Vernonia dendigulensis* DC.

Lysistemma dendigulense (DC.) Steetz in Peters, Reise Mossamb. Bot. 341. 1864.

Vernonia indica C. B. Clarke, Comp. Ind. 16. 1876. Western peninsular India.

Acilepis nantcianensis (Pamp.) H. Rob., comb. nov. basionym: *Vernonia bracteata* var. *nantcianensis* Pamp., Nouv. Giorn. Bot. Ital., n.s. 18:98. 1911.

Vernonia silhetensis var. *nantcianensis* (Pamp.) Hand.-Mazz., Symb. Sin. 7: 1084. 1936.

Vernonia nantcianensis (Pamp.) Hand.-Mazz., Noitsibl. Bot. Gart. Mus. Berl.-Dahl. 13:608. 1937. China.

Acilepis saligna (DC.) H. Rob., comb. nov. basionym: *Vernonia saligna* DC., Prodr. 5:33. 1836.

Vernonia longicaulis DC., Prodr. 5:33. 1836.

Vernonia martinii Vaniot, Bull. Acad. Intern. Geogr. Bot. 12:124. 1903.

Vernonia sequinii Vaniot, Bull. Acad. Intern. Geogr. Bot. 12:241. 1903. China, India, Myanmar.

Acilepis scariosa (DC.) H. Rob., comb. nov. basionym: *Decaneurum scariosum* DC., Prodr. 7:264. 1838.

Vernonia scariosa Arn., Nova Acta Phys. Med. Acad. Caes. Leop. Carol. Nat. Cur. 18:346. 1836, hom. illeg., not *V. scariosa* Poir., 1808.

Gymnanthemum scariosum (DC.) Sch. Bip. ex Walp., Rep. 2:949. 1843.

Centratherum scariosum C. B. Clarke, Comp. Ind. 4. 1876.

Vernonia lankana Grierson, Ceylon J. Sci., Biol. Sci. 10:43. 1972.
Sri Lanka.

Acilepis silhetensis (DC.) H. Rob., comb. nov. basionym: *Decaneurum silhetense* DC., Prodr. 5:67. 1836.

Eupatorium glabrum Heyne ex Wallich, Num. List. Dr. pl. 3283. 1831, nom. nud.

Decaneurum glabrum DC., Prodr. 5:67. 1836.

Gymnanthemum glabrum (DC.) Sch. Bip. ex Walp., Rep. 2:948. 1843.

Gymnanthemum silhetense (DC.) Sch. Bip. ex Walp., Rep. 2:948. 1843.

Xipholepis silhetensis (DC.) Steetz in Peters, Reise Mossamb. Bot. 344. 1864.

Vernonia bracteata Wall. ex C. B. Clarke, Comp. Ind. 17. 1876.

Vernonia silhetensis (DC.) Hand.-Mazz., Symb. Sin. 7:1084. 1936.
China, India, Thailand.

Acilepis spirei (Gandog.) H. Rob., comb. nov. basionym: *Vernonia spirei* Gandog., Bull. Soc. Bot. France 54:194. 1907.
China, Laos, Vietnam.

Acilepis squarrosa D. Don, Prodr. Fl. Nepal 169. 1825.

Vernonia squarrosa (D. Don) Less., Linnaea 6:627. 1831.

Vernonia rigiophylla DC., Prodr. 5:15. 1836.

Vernonia teres Wall. ex DC., Prodr. 5:15. 1836.
China, India, Nepal, Sikkim, Thailand, Vietnam.

Bechium DC., Prodr. 5:70. 1836. Type: *Bechium scapiforme* DC.

Erect or subhorizontally proliferating annual or biennial herbs, 1–4 dm high; hairs mostly of one long cell, appearing sericeous, red stipitate glands with multicellular tips on stems and bracts. Leaves alternate, rosulate or subrosulate, subsessile, blades oblong. Inflorescences scapiform with 1 to many corymbosely disposed heads. Heads shortly to longly pedunculate; involucre bracts ca. 30 in ca. 3 series, with red stipitate glandular hairs; receptacle epaleaceous. Florets 25–50; corollas reddish-violet, slender tubes funnelform above, throat very short, lobes with sparse biseriate non-glandular hairs, rarely with stipitate reddish gland at tip; anther bases rounded, without tails; apical appendage glabrous, with thin cell walls; style base with distinct wide node; style with sweeping hairs fat, pointed, few to many septate. Achenes 10-costate, with many unevenly pointed setulae, many idioblasts, raphids elongate with rhomboid tips; pappus with single series of easily deciduous to subpersistent bristles and short outer squamae, bristles narrowed below, some wider distally. Pollen tricolporate, non-lophate, echinate.

The genus is recognized primarily on the basis of the herbaceous annual or biennial habit, elongate raphids of the achene wall, slender white pappus bristles, type A pollen, and the rather broad, pointed sweeping hairs with few to many septations. The species placed in the genus here are two of the members of the Vernonieae in Madagascar that have reddish glands with multicellular caps on their peduncles and involucre bracts. Both species need new combinations since the oldest name for the type species has never been transferred to the genus.

Bechium nudicaule (Less.) H. Rob., comb. nov. basionym: *Vernonia nudicaulis* Less., Linnaea 6:637. 1831.

Bechium scapiforme DC., Prodr. 5:71. 1836.

Vernonia scapiformis (DC.) Drake, Bull.

Soc. Bot. France 46:244. 1889.
Madagascar.

Bechium rhodolepis (Baker) H. Rob.,
comb. nov. basionym: *Vernonia rhodo-*
lepis Baker, J. Bot. 20:139. 1882.

Vernonia purpureo-glandulosa Klatt,
Bot. Jahrb. Syst. 12 (Beibl. 27):21.
1890.
Madagascar.

Cabobanthus H. Rob., gen. nov. (Erlangei-
nae).
Type: *Vernonia polysphaera* Baker.

Plantae herbaceae perennes base tuberosae.
Caules subglabri aut tomentosi, pilis simpli-
cibus uniseriatis multiseptatis. Folia alterna
sessilia vel subsessilia. Capitula in axillares
superiores ad 5 aggregata; involucria infun-
dibularia, bracteis ca. 35 in seriebus ca. 5
ovatis vel oblongis apiculatis; receptacula
epaleacea. Flores ca. 10 in capitulo; corollae
purpureae, tubis cylindricibus superne infun-
dibularibus; faucibus quam theceis dimidiis
brevioribus; thecae base breviter caudatae;
appendices antherarum apicales in parietibus
cellularibus tenues non glanduliferae; basi
stylorum noduliferi; rami stylorum aciculifor-
miter papilloso. Achenia 8–10-costatae, setulis
in cellulis aequales, raphidis minutis anguste
oblongis; setae pappi arcte barbellatae. Grana
pollinis triporate ca. 35 μm lacunosa emicro-
punctata.

The genus is notable for the erect stems
bearing axillary clusters of heads and the
triporate, emicropunctate pollen grains. The
following two species are recognized:

Cabobanthus bullulatus (S. Moore) H.
Rob., comb. nov., basionym: *Vernonia*
bullulata S. Moore, J. Bot. 65, suppl. 2:
44. 1927.
Zambia.

Cabobanthus polysphaerus (Baker) H.
Rob., comb. nov., basionym: *Vernonia*
polysphaera Baker, Kew Bull. 1898:148.
1898.

Vernonia humblei De Wild., Repert.
Spec. Nov. Regni Veg. 13:207. 1914.
Congo, Tanzania, Zambia.

Cyanthillium Blume, Bidjr. 889. 1826.
Type: *Cyanthillium villosum* Blume.

Isonema Cass., Bull. Soc. Philom. Paris
1817:152. 1817, hom. illeg., not *Iso-*
nema R. Br., 1810. Type: *Isonema*
ovata Cass.

Vernonia sect. *Tephrodes* DC., Prodr. 5:
24. 1836. Lectotype: *Conyza cinerea*
Blume (Jones 1981).

Cyanopsis Blume ex DC., Prodr. 5:69.
1836, nom. illeg. et superfl., not Cass.,
1817.

Claotrachelus Zoll. & Moritz ex Zoll.,
Natuur-Genrsk. Arch. Ned. Indië 2:
263, 565. 1845. Type: *Claotrachelus*
rupestris Zoll. & Moritz ex Zoll.

Seneciodes L. ex Post & O. Kuntze, Lex.
Gen. Phan. 2:515. 1903. Type: *Conyza*
cinerea L.

Triplotaxis Hutch., Bull. Misc. Inform.
1914:355. 1914. Lectotype: *Herderia*
stellulifera Benth. in Hook.f. (Robin-
son 1990).

Vernonia subsect. *Tephrodes* (DC.) S. B.
Jones, Rhodora 83:70. (1981).

Annual or short-lived perennial herbs ca. 1
m tall; stem hairs asymmetrically and sym-
metrically T-shaped. Leaves alternate, nar-
rowly petiolate, blades thinly papery. Inflo-
rescences terminal, corymbose to pyramidal
cymes. Heads pedunculate; involucrial bracts
papery, green with pale or purplish margins,
ca. 30 in 3(–5) gradate series, persistent; re-
ceptacle epaleaceous. Florets 15–94; corollas
bluish to lavender, funnellform with slender
lower tubes, throat a third as long to nearly
as long as lobes, lobes with simple hairs es-
pecially near tips; anthers without tails; apical
appendages glabrous, with thin cell walls;
style base with broad node; sweeping hairs
acicular. Achenes 5-angled or ribbed, or te-
rete, with idioblasts, sometimes with glands,
raphids elongate; pappus with many long,
fragile, slender-tipped bristles or squamellae,
persistent, with callose ring in one species.
Pollen triporate, echinolophate. $N = 9, 11, 18$
(Jones 1979, 1982).

The synonymy follows that in Robinson

(1990a) with the removal of *Vernonia* subsections *Orbisvestus* and *Hilliardiana*. Attempts to interpret the genus more broadly to include *Gutenbergia* Sch.Bip. ex Walp. (Robinson, 1990b), are rejected here. At this time, other more closely related species, with shrubbier habits, non-lophate pollen, tailed anthers and T-shaped hairs or no hairs on the corolla lobes, are placed in separate genera (see *Hilliardiella* and *Orbivestus* below). The species of *Cyanthillium* are all annuals or weak perennial subshrubs with triplicate lophate pollen. The following seven species are presently placed in the genus.

Cyanthillium albicans (DC. in Wight) H. Rob., comb. nov. basionym: *Vernonia albicans* DC. in Wight, Contrib. Bot. Ind. 6. 1834.

Western peninsular India.

Cyanthillium cinereum (L.) H. Rob., Proc. Biol. Soc. Wash. 103:252. 1990.

Conyza cinerea L., Sp. Pl. 862. 1753.

Vernonia cinerea (L.) Less., Linnaea 4: 291. 1829.

Seneciodes cinerea (L.) Post & O. Kuntze, Lex. Gen. Phan. 2:515. 1903.

Throughout paleotropical region, widely adventive in Neotropics.

Cyanthillium conyzoides (DC. in Wight) H. Rob., comb. nov. basionym: *Vernonia conyzoides* DC. in Wight, Contr. Bot. Ind. 6. 1834.

Western peninsular India.

Cyanthillium hookerianum (Arn.) H. Rob., comb. nov. basionym: *Vernonia hookeriana* Arn., Nov. Act. Nat. Cur. 18:346. 1836.

Sri Lanka.

Cyanthillium patulum (Ait.) H. Rob., Proc. Biol. Soc. Wash. 103:252. 1990.

The synonymy is as in Robinson (1990a) with the exclusion of *Conyza chinensis* Lam. and its combinations.

Tropical Asia, Indonesia, Madagascar, adventive in West Indies.

Cyanthillium stelluliferum (Benth.) H.

Rob., Proc. Biol. Soc. Wash. 103:252. 1990.

Herderia stellulifera Benth. in Hook. f. & Benth., Niger Fl., 425. 1849.

Triplotaxis stellulifera (Benth.) Hutch., Bull. Misc. Inf. Kew 1914:356. 1914. West and central tropical Africa, Uganda to Angola.

Cyanthillium vernonioides (Muschl.) H. Rob., comb. nov. basionym: *Erlangea vernonioides* Muschl., Bot. Jahrb. Syst. 46:62. 1911, not *Vernonia vernonioides* (A. Gray) Bacigalupo, 1931.

Vernonia meiostephana C. Jeffrey, Kew Bull. 43:225. 1988.

Hilliardiella H. Rob. gen. nov. (Erlangeinae). Type: *Vernonia pinifolia* Less.

Webbia DC., Prodr. 5:72. Oct. 1836, lectotype *Vernonia pinifolia* Less., hom. illeg., not *Webbia* Spach, Jun 1836.

Vernonia subsect. *Hilliardiana* S. B. Jones, Rhodora 83:66. 1981. Type: *Vernonia oligocephala* (DC.) Sch. Bip.

Plantae herbaceae perennes ad 1 m altae; caules pilosi, pilis aequaliter T-formibus. Folia alterna; laminae subtus saepe dense canescentiter pilosae. Inflorescentiae laxae vel subdense corymbosae cymosae; capitula pedunculata; involucria campanulata; bracteae 25–40 ca. 3–4-seriatae persistentes; receptacula epaleacea. Flores 12–20 in capitulo; corollae purpureae extus pauca vel dense pilosae, pilis T-formibus leniter contortis; tubis superne infundibularibus, faucibus brevibus, lobis linearibus; thecae base non vel breviter appendiculatae; appendices apicales antherarum glabrae in parietibus cellularum tenuis; basi stylorum noduliferi, papillae ramorum aciculiformes. Achenia 4–5-costata dense setulifera et idioblastifera, raphidis elongatis; carpodia anguste cylindrica; setae pappi albae barbatae tenues subpersistentes, seriebus exteriores breviter lanceolatae. Grana pollinis non lophata tricolporata echinata. Numerus chromosomatum N = 9, 10 (Jones 1942).

Chemistry reported for the genus in-

cludes germacranolides, hirsutanolides, quaianolides and bisabolene derivatives (Bohlmann & Jakupovic 1990). Most chromosome counts have reported $N = 10$.

Hilliardiella is closely related to *Cyanthillium*, but it seems consistently different by the more perennial habit, the non-lophate pollen, and especially the T-shaped hairs of the corolla. The group has been rather well defined at various levels by Candolle (1836) and Jones (1981).

The name is derived from the subsectional name of Jones (1981), but the genus is described as new to avoid any complications from spelling. The name, as indicated by Jones (1981), honors Dr. Olive M. Hilliard, student of the Asteraceae of Natal. The following eight species are credited to the genus.

Hilliardiella aristata (DC.) H. Rob., comb. nov. basionym: *Webbia aristata* DC., Prodr. 5:73. 1836, not *Vernonia aristata* Less., 1829.

Vernonia natalensis Sch. Bip. ex Walp., Rep. 2:947. 1843.
South Africa.

Hilliardiella calyculata (S. Moore) H. Rob., comb. nov. basionym: *Vernonia calyculata* S. Moore, J. Linn. Soc. Bot. 35:316. 1902.
Congo, Tanzania, Malawi, Mozambique, Zambia.

Hilliardiella hirsuta (Sch. Bip. ex Walp.) H. Rob., comb. nov. basionym: *Vernonia hirsuta* Sch. Bip. ex Walp., Rep. 2:947. 1843.
South Africa.

Hilliardiella leopoldii (Vatke) H. Rob., comb. nov. basionym: *Vernonia leopoldii* Vatke, Linnaea 39:478. 1878.
Ethiopia.

Hilliardiella nudicaulis (DC.) H. Rob., comb. nov. basionym: *Webbia nudicaulis* DC., Prodr. 5:73. 1836.

Vernonia dregeana Sch. Bip. ex Walp., Rep. 2:947. 1843.
South Africa.

Hilliardiella oligocephala (DC.) H. Rob.,

comb. nov. basionym: *Webbia oligocephala* DC., Prodr. 5:73. 1836.

Webbia elaeagnoides DC., Prodr. 5:73. 1836, not *Vernonia elaeagnoides* H.B.K., 1818.

Vernonia oligocephala (DC.) Sch. Bip. ex Walp., Rep. 2:947. 1843.

Vernonia krausii Sch. Bip. ex Walp., Rep. 2:947. 1843.

Tanzania south to the Cape Province.

Hilliardiella pinifolia (Less.) H. Rob., comb. nov. basionym: *Vernonia pinifolia* Less., Linnaea 4:257. 1829.

Webbia pinifolia (Less.) DC., Prodr. 5:72. 1836.

South Africa.

Hilliardiella smithiana (Less.) H. Rob., comb. nov. basionym: *Vernonia smithiana* Less., Linnaea 6:638. 1831.

West and Central Tropical Africa.

Orbivestus H. Rob., gen. nov. (Erlangeinae). Type: *Vernonia karaguensis* Oliv. & Hiern.

Vernonia subg. *Orbisvestus* S. B. Jones, Rhodora 83:60. 1981. Type: *Vernonia karaguensis* Oliv. & Hiern.

Plantae suffrutescentes vel frutescentes; caules pilosi, pilis T-formibus. Folia alterna breviter petiolata; laminae sparse pilosae. Inflorescentiae laxae corymbose cymosae. Capitula pedunculata; involucria campanulata; bractae 25–30 ca. 4-seriatae persistentes; receptacula epaleacea. Flores 8–16 in capitulo; corollae purpureae extus non vel perpauca pilosae, pilis raris sub-T-formibus, tubis superne leniter infundibularibus, faucibus et lobis subaequilongis, lobis longe triangularibus; thecae antherarum base breviter vel longe caudatae; appendices antherarum apicales glabrae in parietibus cellularum tenues; basi stylorum breviter et distincte noduliferi; papillae ramorum aciculiformes. Achenia 4–5-costata setulifera multo idioblastifera, raphidis elongatis; carpodia anguste cylindrica; setae pappi barbellatae facile deciduae, squamis exterioribus brevis persistentibus. Grana pollinis non lophata tricolporata echin-

ata. Numerus chromosomatum $N = 9, 20$ (Mangenot & Mangenot 1962, Mehra et al. 1965, Jones 1982).

The genus *Orbivestus* is distinct from the related *Cyanthillium* by the more shrubby habit, the lack of simple hairs on the corolla lobes, and the non-lophate pollen. It is distinct from *Hilliardiella* by the longer corolla throats and more triangular lobes that bear few or no hairs. The few hairs seen on the corolla lobes in the type species are asymmetrically T-shaped, quite different from those in *Hilliardiella*. The genus has more prominent tails on the anthers than in either of the related genera. Chemical constituents include 5-alkyl coumarins, bisabolene derivatives and glaucolides (Bohlmann & Jakupovic 1990).

Although the subgeneric name by Jones (1981) is the inspiration for the generic name, the genus has been described as new to avoid the consistent extra "s" in the Jones spelling. Jones did not explain his spelling, and the reason for his choice is unknown. The spelling used here is that found in Jeffrey (1988) and Bohlmann & Jakupovic (1990). Still, it seems unnecessary to completely abandon the name coined by Jones.

The following four species are placed in the genus.

Orbivestus cinerascens (Sch. Bip. in Schweinf.) H. Rob., comb. nov. basionym: *Vernonia cinerascens* Sch. Bip. in Schweinf., Beitr. Fl. Aeth. 162. 1897.

Vernonia tephrodioides Chiov., Fl. Somal. 2:255. 1932.

Senegal east to western India, south to Angola and Botswana.

Orbivestus homilanthus (S. Moore). H. Rob., comb. nov. basionym: *Vernonia homilantha* S. Moore, J. Bot. 41:138. 1903.

Vernonia sennii Chiov., Fl. Somal. 2:256. 1932.

Kenya, Somalia.

Orbivestus karaguensis (Oliv. & Hiern) H.

Rob., comb. nov. basionym: *Vernonia karaguensis* Oliv. & Hiern, Trans. Linn. Soc. London 29:91. 1873.

Vernonia cistifolia O. Hoffm., Engl. Pflanzenw. Ost-Afr. C 404. 1895.

Vernonia elliotii S. Moore, J. Linn. Soc. Bot. 35:315. 1902.

Vernonia bothrioclinoides C. H. Wright, Bull. Misc. Inf. 1906:108. 1906.

Vernonia porphyrolepis S. Moore, J. Bot. 46:39. 1908.

Vernonia campanea S. Moore, J. Bot. 54:251. 1916.

Vernonia melanacrophylla Cufod., Nouv. Giorn. Bot. Ital., n.s. 50:102. 1943.

Sudan south to Mozambique and Zimbabwe, west to Nigeria.

Orbivestus undulatus (Oliv. & Hiern) H. Rob., comb. nov. basionym: *Vernonia undulata* Oliv. & Hiern, Fl. Trop. Afr. 3:276. 1877.

West and central tropical Africa, north to Sudan, south to Angola.

Oocephala (S. B. Jones) H. Rob., stat. nov. (Erlangeinae).

Vernonia subsect. *Oocephalae* S. B. Jones, Rhodora 83:72. 1981.

Type species: *Vernonia oocephala* Baker.

Low much-branched shrubs to 1 m high, stems with weakly L-shaped simple hairs and with multiseptate simple hairs. Leaves alternate, subsessile, linear to elliptical, sometimes serrate. Inflorescences corymbose cymes with usually shortly pedunculate heads or with heads sessile in apical clusters of leaves. Involucre ovoid or cylindrical; bracts 20–40 in 4–7 gradate series, ovate to oblong, appressed; receptacle without pales. Florets ca. 15 in a head; corollas white or lavender, tubular to narrowly funnelform, throat as long as lobes, tips without hairs or with few short biseriate hairs; anther bases rounded, apical appendages glabrous, with thin-walled cells; style base with indistinct ring; style branches with acicular sweeping hairs. Achenes weakly 8-ribbed, sericeous with many setulae, idioblasts numerous, raphids narrowly elon-

gate; pappus biseriate, outer shorter and broader, inner setiform, subplumose, glabrous near base. Pollen triporate, lophate, minutely papillate on murae, emicropunctate or weakly micropunctate.

The genus is distinguished by subplumose inner pappus, triporate pollen and stems with weakly L-shaped hairs. *Vernonia* sect. *Oocephala* is based on a single species with pedunculate ovoid heads containing few tubular florets. The additional species here referred to *Oocephala* was described by Jeffrey (1988) in his Group 3 subgroup A with *Centrapalus*, but the achene is most like *Oocephala* and *Vernoniastrum*, and a small corolla remnant shows triporate pollen. The species is not related to the *Centraplinae*, and is placed here on the basis of its subplumose pappus, in spite of considerable difference in general appearance.

The genus contains the following two species.

Oocephala agrianthoides (C. Jeffrey) H. Rob., comb. nov. basionym: *Vernonia agrianthoides* C. Jeffrey, Kew Bull. 43: 227. 1988.

Burundi, Congo, Tanzania.

Oocephala stenocephala (Oliv.) H. Rob., comb. nov. basionym: *Vernonia stenocephala* Oliv. in Hook., Ic. Pl. 14:35, t. 1349A. 1881.

Vernonia oocephala Baker, Bull. Misc. Inf. 1895:68. 1895.

Vernonia luteoalbida De Wild., Repert. Spec. Nov. Regni Veg. 13:207. 1913. Nigeria east to Tanzania and south to Mozambique.

Polydora Fenzl, Flora 27:312. 1844. Type species: *Polydora stoechadifolia* Fenzl = *Webbia serratuloides* DC.

Crystallopollen Steetz in Peters, Reise Mossamb. Bot. 363. 1864. Type species: *Crystallopollen angustifolium* Steetz.

Mostly annuals; stems with one-armed T-shaped hairs. Leaves alternate. Inflorescence a lax thyrsoid panicle with corym-

bosely cymose branches with pedunculate heads or with single terminal head. Involucral bracts ca. 80 in ca. 7 series, often with widely scarious margins and awned often black tips, receptacles epaleaceous. Florets ca. 30 in a head; corollas whitish to purplish, tube longly funnelform, throat as long as the narrow glabrous lobes; anther bases plain, not tailed; apical appendage glabrous, with cell walls thin, sometimes weakly ornate; style base with distinct annular node; branches with acicular sweeping hairs. Achenes 5 or 8–10 ribbed, setuliferous, raphids narrowly elongate; pappus with copious barbellate setae, greenish, yellowish or tawny, rarely white; outer pappus short, squamiform. Pollen triporate, scarcely echinolophate to psilolophate, with or without micropunctations. Chromosome number $N = 9$ (Jones 1979, 1982). Reported sesquiterpene lactones are germacranolides, hirsutanolides and furanoheliangolides (Bohlmann & Jakupovic 1990).

The genus is distinct in the annual habit, chromosome number of $N = 9$, the one-armed T-shaped hairs, untailed anthers and triporate pollen.

Some of the species of the *Vernonia chloropappa* group are keyed by Pope (1986).

The genus is here credited with the following eight species.

Polydora angustifolia (Steetz in Peters) H. Rob., comb. nov. basionym: *Crystallopollen angustifolium* Steetz in Peters, Reise Mossamb. Bot. 366. 1864, not *Vernonia angustifolia* Michx., 1803 or *V. angustifolia* D. Don ex Hook. & Arn., 1835.

Vernonia erinacea H. Wild, Kirkia 11:2. 1978.

Tanzania and Mozambique, east to Zambia and Zimbabwe.

Polydora bainesii (Oliv. & Hiern) H. Rob., comb. nov. basionym: *Vernonia bainesii* Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3: 272. 1877.

Tanzania and Mozambique, east to Zambia and Zimbabwe.

Polydora chloropappa (Baker) H. Rob., comb. nov. basionym: *Vernonia chloropappa* Baker, Bull. Misc. Inf. 1898:146. 1898.

Vernonia kassneri De Wild. & Muschl., Bull. Soc. Bot. Belg. 49:242. 1912.

Vernonia smaragdopappa S. Moore, J. Linn. Soc. Bot. 47:284. 1925.

Congo, Malawi, Tanzania, Zambia.

Polydora jelfiae (S. Moore) H. Rob., comb. nov. basionym: *Vernonia jelfiae* S. Moore, J. Linn. Soc. Bot. 47:262. 1925. Angola, Burundi, Congo, Malawi, Tanzania, Zambia, Zimbabwe.

Polydora poskeana (Vatke & Hildebr.) H. Rob., comb. nov. basionym: *Vernonia poskeana* Vatke & Hildebr., Oesterr. Bot. Zeitschr. 25:324. 1875.

Angola, Botswana, Namibia, Transvaal, Zimbabwe.

Polydora serratuloides (DC.) H. Rob., comb. nov. basionym: *Webbia serratuloides* DC., Prodr. 5:72. 1836, not *Vernonia serratuloides* H. B. K., 1818.

Vernonia perrottetii Sch. Bip. ex Walp., Rep. 2:947. 1843.

Polydora stoechadifolia Fenzl, Flora 27: 312. 1844.

West and central tropical Africa from Sudan and Ethiopia south to Angola and Zambia.

Polydora steetziana (Oliv. & Hiern) H. Rob., comb. nov. basionym: *Vernonia steetziana* Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:278. 1877.

South Africa.

Polydora sylvicola (G. V. Pope) H. Rob., comb. nov. basionym: *Vernonia sylvicola* G. V. Pope., Kew Bull. 41:395. 1986.

Angola, Congo, Malawi, Mozambique, Tanzania, Zambia, Zimbabwe.

Vernoniastrum H. Rob., gen. nov. (Erlangeinae) Type: *Crystallopollen latifolium* Steetz in Peters

Vernonia sect. *Lepidella* Oliv. & Hiern, Fl. Trop. Afr. 3:267. 1877. Type: *Vernonia petersii* Oliv. & Hiern, not *Lep-*

idella Tiegh., 1912 or *Lepidella* E. J. Gilbert, 1925.

Vernonia subsect. *Lepidella* (Oliv. & Hiern) S. B. Jones, Rhodora 83:72. 1981.

Plantae herbaceae perennes 0.3–1.0 m altae; caules pilosi, pilis simplicibus in cellulis apicalibus elongatis base leniter inaequalibus. Folia alterna. Inflorescentiae uni- vel multo capitatae. Involucra campanulata; bractae ca. 50 in ca. 3 series gradatae persistentes; receptacula epaleacea. Flores ca. 50 in capitulo; corollae rubro-purpurascens, tubis anguste infundibularibus, faucibus quoad lobis et thecis brevioribus, lobis distaliter pilosis; thecae antherarum base acuminate vel acute caudatae; appendices antherarum apicales glabrae in parietibus cellarum tenues; base stylorum noduliferi; rami stylorum aciculariter piliferi. Achenia 4–5-angulata, idioblastis saepe in seriebus transversalibus aggregatis, raphidis elongatis; setae pappi interiores margine dense barbellatae subpersistentes, squamae exteriores lateriores persistentes. Grana pollinis triporata lophata micropunctata vel emicropunctata. Numerus chromosomatum $N = 10$ (Jones 1979, 1982).

Vernoniastrum seems closely related to the foregoing *Polydora* Fenzl, but differs by the perennial habit, the non-T-shaped hairs, the tailed anther bases and the chromosome number of $N = 10$. The core element of the genus also has the idioblasts of the achene in distinct transverse bands, a feature not seen outside of the genus *Vernoniastrum*.

The genus is credited here with the following eight species:

Vernoniastrum aemulans (Vatke) H. Rob., comb. nov. basionym: *Vernonia aemulans* Vatke, Oesterr. Bot. Zeitschr. 27:195. 1877.

Kenya, Tanzania.

Vernoniastrum ambiguum (Kotschy & Peyr.) H. Rob., comb. nov. basionym: *Vernonia ambigua* Kotschy & Peyr., Pl. Tinn., 35, t. 17B. 1867.

West tropical Africa to Sudan and Tanzania and south to Angola.

- Vernoniastrum latifolium* (Steetz in Peters) H. Rob., comb. nov. basionym: *Crystallopollen latifolium* Steetz in Peters, Reise Mossamb. Bot. 364, t. 48a. 1864, not *V. latifolia* Lem., 1855.
- Vernonia petersii* Oliv. & Hiern, Trans. Linn. Soc. London 29:90. 1873.
- Vernonia eriocephala* Klatt, Bull. Herb. Boiss. 4:826. 1896.
Angola and Congo east to Mozambique and Tanzania.
- Vernoniastrum musofense* (S. Moore) H. Rob., comb. nov. basionym: *Vernonia musofensis* S. Moore, J. Bot. 56:206. 1918.
- Vernonia lappoides* O. Hoffm., Bol. Soc. Brot. 13:19. 1896, hom. illeg., not Baker, 1873.
- Vernonia miamensis* S. Moore, J. Bot. 64:304. 1926.
- Vernonia hoffmanniana* Hutsch. & Dalz., Fl. W. Trop. Afr. 2:167. 1931, nom. nov. for *V. lappoides* O. Hoffm.
- Vernonia philipsoniana* Lawalree, Expl. Hydrobiol. Lac. Tanganyika (1946–47) Rés. Sc. 4, 2:59. 1955; nom. nov. superfl. for *V. lappoides* O. Hoffm.
Tropical Africa from Nigeria to Tanzania, south to Angola and Zimbabwe.
- Vernoniastrum nestor* (S. Moore) H. Rob., comb. nov. basionym: *Vernonia nestor* S. Moore, J. Linn. Soc. Bot. 35:317. 1902.
- Vernonia chariensis* O. Hoffm., Bull. Soc. Bot. France 55, mém. 8:40. 1908.
- Vernonia cannabina* Muschl., Bot. Jahrb. Syst. 46:94. 1911.
West Africa east to Tanzania south to Natal.
- Vernoniastrum ugandense* (S. Moore) H. Rob., comb. nov. basionym: *Vernonia ugandensis* S. Moore, J. Linn. Soc. Bot. 35:314. 1902.
- Vernonia caput-medusae* S. Moore, J. Linn. Soc. Bot. 37:166. 1905.
- Vernonia fontinalis* S. Moore, J. Bot. 52: 90. 1914.
- Vernonia punctulata* S. Moore, J. Linn. Soc. Bot. 47:262. 1925.
- Vernonia proclivicola* S. Moore, J. Linn. Soc. Bot. 47:262. 1925.
- Vernonia mgetae* Gilli, Ann. Naturhist. Mus. Wien 78:164. 1974.
Congo, Burundi and Tanzania south to Angola, Zambia and Mozambique.
- Vernoniastrum uncinatum* (Oliv. & Hiern ex Oliv.) H. Rob., comb. nov. basionym: *Vernonia uncinata* Oliv. & Hiern ex Oliv., Fl. Trop. Afr. 3:277. 1877.
- Vernonia amplexicaulis* Baker, Kew Bull. 1895:216. 1895.
Ethiopia, Kenya, Somalia.
- Vernoniastrum viatorum* (S. Moore) H. Rob., comb. nov. basionym: *Vernonia viatorum* S. Moore, J. Linn. Soc. Bot. 35: 315. 1912.
Malawi.
- Koyamasia* H. Rob., gen. nov. (Erlangeinae). Type: *Camchaya calcarea* Kitam.
- Plantae herbaceae perennes ad 0.5 m altae paucis ramosae; caules pilis simplicibus multiseptatis obsiti. Folia alterna anguste petiolata. Inflorescentiae terminales et axillares. Capitula longe pedunculata late campanulata; bracteae involucri ca. 90 ca. 4–5-seriatae persistentes in partibus majoribus herbaceae et reflexae; receptaculum glabrum. Flores ca. 90 in capitulo; corollae tenuiter carnosae, tubis angustis, faucibus abrupte campanulatis, lobis quoad faucibus leniter longioribus non reflexis extus glanduliferis; thecae antherarum valde exertae saepe nigricans base rotundatae, cellulis endothelialibus elongatis, in apicibus noduliferis; appendices apicales antherarum non longiores quam lateriores glabrae in parietibus cellularum firmis; basi stylorum non noduliferi. Achenia 10-costata glabra; raphidis minutis anguste oblongis; setae pappi paucae breves facile deciduae. Grana pollinis triplicata emicropunctata. Numerus chromosomatum $2N = 54$ (Koyama 1984).
- The genus *Koyamasia* is established for a single Southeast Asian species occurring in limestone areas. It was originally described

in *Camchaya* Gagnep., but was excluded from it by Koyama (1984). The species is similar to *Camchaya* in its geography and reduced pappus, but it differs in the triporate rather than tricolporate lophate pollen and the simple rather than T-shaped hairs. The genus may be more closely related to *Kinghamia* C. Jeffrey, which contrary to its original description, has triporate rather than tricolporate pollen, and is not closely related to *Linzia*. The West African *Kinghamia* is similar, but is a less robust plant with narrower leaf blades and much smaller heads. *Kinghamia* may represent convergent evolution in many of its similarities, but it seems to differ from *Koyamasia* by only some technical characteristics such as the reflexed mature corolla lobe tips, the presence of a basal stylar node, the pale and only partially exerted anthers, the longer anther appendages and the subquadrate endothelial cells without nodular thickenings.

The single species is as follows:

Koyamasia calcarea (Kitam.) H. Rob., comb. nov. basionym: *Camchaya calcarea* Kitam., Acta Phytotax. Geobot. 23: 71. 1968.

Thailand.

Phyllocephalum Blume, Bidjr. Fl. Ned. Ind. 888. 1826. Type: *Phyllocephalum frutescens* Blume

Decaneurum DC. ex Wight, Contr. Bot. Ind. 7–8. (1833), not *Decaneurum* DC., 1836. Type: *Decaneurum reticulatum* DC. ex Wight [= *Phyllocephalum indicum* (Less.) Kirkman]

Rolfinkia Zenker, Pl. Ind. 13. 1837. Type: *Rolfinkia centaureoides* Zenker [= *Phyllocephalum indicum* (Less.) Kirkman].

Lamprachaenium Benth, in Benth. & Hook. f., Gen. pl. 2:225. (1873). Type: *Decaneurum microcephalum* Dalzell

The herbaceous genera *Phyllocephalum* Blume of India and Indonesia, with three species (Kingham, 1981), and *Lamprachaenium* Benth. of India, with one species, have been examined and found to differ mostly by the costate achenes of the former versus the shiny

dark ecostate achenes of the latter. In both genera, the achenes are oblong and glabrous, somewhat obcompressed, abruptly rounded above to the narrow attachment of the corolla, the pappus is of short highly deciduous setae and the raphids in the achene wall are subquadrate. Both genera have lophate triporate pollen with minutely spinulose margins of the muri as seen in Kirkman (1981) and Robinson & Marticorena (1986). Both have foliose lower involucral bracts or foliose tips on the bracts. The genera are here considered the same and the needed combination is as follows:

Phyllocephalum microcephalum (Dalzell) H. Rob., comb. nov. basionym: *Decaneurum microcephalum* Dalzell, Hooker's J. Bot. Kew Gard. Misc. 3:231. 1851. India.

New Genera and New Combinations of Eastern Hemisphere Vernoniaceae
Subtribe Centrapalinae H. Rob.

Centrapalus Cass., Bull. Soc. Philom. Paris 1817:10. 1817. Type: *Centrapalus galamensis* Cass.

Vernonella Sond., Linnaea 23:62. 1850.
Type: *Vernonella africana* Sond.

Annual or perennial, scapose or subsca-pose herbs, with or without brown woolly hair on crown of rootstock, anthesis often prior to leaf emergence; stem hairs simple, multiseptate. Leaves basal or cauline, alternate, sessile. Inflorescences terminal on stems and branches. Involucre hemispherical; bracts 125–150 in ca. 5 gradate series, linear, green, often with small teeth on distal margin; receptacle epaleaceous. Florets ca. 100 in a head; corollas light blue to bluish purple, tube funnellform above, throat nearly half as long as thecae, lobes sometimes fringed with long papillae; anther base not tailed; apical anther appendage glabrous, often colored, with slightly thickened cell walls; style base with broad node. Achenes weakly 10-costate, setuliferous, raphids narrowly oblong; pappus setae long, subpersistent, outer series setiform,

short. Pollen tricolporate, echinate, lophate or non-lophate, without muri projecting into colpi, micropunctate. Chromosome number $N = 9$ (Jones 1974, 1979, 1982). Sesquiterpene lactones include elemanolides (Bohlmann & Jakupovic 1990).

The name *Centrapalus* has been used most recently within the broad concept of *Vernonia* for a group of coarse annual or perennial African herbs. The genus is of some potential commercial importance for the extraction of epoxy resins (Ayorinde et al., 1990). The proper combination has not previously been provided for the type species, and an additional eight species are placed in the genus here.

Centrapalus acrocephalus (Klatt) H. Rob., comb. nov. basionym: *Vernonia acrocephala* Klatt, Ann. Hofmus. Wien 7:100. 1897.

Sierra Leone, Nigeria and Congo south to Angola and Zimbabwe.

Centrapalus africanus (Sond.) H. Rob., comb. nov. basionym: *Vernonella africana* Sond., Linnaea 23:62. 1850.
South Africa.

Centrapalus chthonocephalus (O. Hoffm.) H. Rob., comb. nov. basionym: *Vernonia chthonocephala* O. Hoffm., Bol. Soc. Brot. 13:17. 1896.

Sierra Leone and Sudan south to Angola and Malawi.

Centrapalus denudatus (Hutch. & Burt) H. Rob., comb. nov. basionym: *Vernonia denudata* Hutch. & Burt, Rev. Zool. Bot. Afr. 23:37. 1932.

Congo, Tanzania, Zambia.

Centrapalus kirkii (Oliv. & Hiern in Oliv.) H. Rob., comb. nov. basionym: *Vernonia kirkii* Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:274. 1877.

Vernonia swynnertonii S. Moore, J. Linn. Soc. Bot. 40:107. 1911.

Vernonia zambesiaca S. Moore, J. Bot. 55:102. 1917.

Tanzania south to Zambia and Mozambique.

Centrapalus pauciflorus (Willd.) H. Rob., comb. nov. basionym: *Conyza pauciflora* Willd., Sp. Pl. 3:1927. 1803.

Centrapalus galamensis Cass., Dict. Sci. Nat., ed. 2, 7:383. 1817.

Vernonia pauciflora (Willd.) Less., Linnaea 4:292. 1829, not (Pursh.) Poir., 1817.

Vernonia afromontana R. E. Fr., Acta Hort. Berg. 9:116. 1929.

Vernonia zernyi Gilli, Ann. Naturhist. Mus. Wein 78:165. 1974.

Vernonia petitiana A. Rich., Tent. Fl. Abyss. 1:373. 1848.

Sudan, Ethiopia, Somalia, Kenya, Uganda, Tanzania, Malawi, Zambia, Mozambique and West Africa.

Centrapalus praemorsus (Muschl.) H. Rob., comb. nov. basionym: *Vernonia praemorsa* Muschl., Bot. Jahrb. Syst. 46:68. 1911.

Angola, Congo, Malawi, Tanzania, Zambia.

Centrapalus purpureus (Sch. Bip. ex Walp.) H. Rob., comb. nov. basionym: *Vernonia purpurea* Sch. Bip. ex Walp., Rep. 2:946. 1843.

Vernonia inulifolia Steud. ex Walp., Rep. 2:946. 1843.

Vernonia jaceoides A. Rich., Tent. Fl. Abyss. 1:376. 1848.

Vernonia rigorata S. Moore, J. Bot. 41:155. 1903.

Vernonia scabrida C. H. Wright, Bull. Misc. Inf. Kew 1906:21. 1906.

Vernonia duemmeri S. Moore, J. Bot. 52:91. 1914.

Vernonia pascuosa S. Moore, J. Linn. Soc. Bot. 47:163. 1925.

Vernonia keniensis R. E. Fr., Acta Hort. Berg. 9:114. 1929.

West, central and south tropical Africa north to Sudan and Ethiopia.

Centrapalus subaphyllus (Baker) H. Rob., comb. nov. basionym: *Vernonia subaphylla* Baker, Bull. Misc. Inf. Kew 1895:290. 1895.

Nigeria, Cameroon, Congo, Tanzania, Angola, Malawi, Zambia.

Linzia Sch. Bip. ex Walp., Rep. 2:948. 1843. Type: *Linzia veronioides* Sch. Bip. ex Walp.

Vernonia sect. *Azureae* S. B. Jones, Rhodora 83:74. 1981. Type: *Linzia glabra* Steetz in Peters

Perennial herbs; stems with simple multiseptate hairs. Leaves alternate, sessile to short-petiolate. Inflorescences corymbiform cymes or single heads with short to long peduncles. Involucre funnelform to campanulate; bracts 50–150 in 5–6 series, often pectinate-denticulate along distal margins, outer tips often elongate, green and recurved; receptacle epaleaceous. Florets ca. 20–50 in a head; corollas bluish, tube very long, funnelform near throat, throat very short, lobes apically stiffly hairy; anther base rounded; apical anther appendage glabrous, triangular, with thickened ornamentation in center; style base with small annulus. Achenes strongly 10-costate, usually with rows of idioblasts along sides of costae, setuliferous, raphids subquadrate to short-oblong; pappus of many somewhat persistent, long bristles, with short outer series. Pollen tricolporate, lophate, with muri intruding into short colpi, single polar lacunae often present, with or without micropunctations. Chromosome number $N = 10$ (Jones 1979, 1982). Sesquiterpene lactones include germacranolides and hirsutanolides (Bohlmann & Jalupovic 1990).

Linzia has been recognized rather accurately in recent literature because of the rather characteristic bluish flowers (Jones 1981) or distinctive pollen (Jeffrey 1988). The species are related to *Centrapalus*, but they differ by the more perennial habit, the very short throats of the corollas, the stronger ribs on the achenes, the idioblasts that are positioned along those ribs in most species and the chromosome number of $N = 10$.

The following seven species are credited to the genus.

Linzia gerberiformis (Oliv. & Hiern in

Oliv.) H. Rob., comb. nov. basionym: *Vernonia gerberiformis* Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:285. 1877.

Vernonia macrocyanus O. Hoffm., Bol. Soc. Brot. 13:20. 1896.

Vernonia nandensis S. Moore, J. Linn. Soc. Bot. 35:323. 1902.

Vernonia towaensis De Wild., Bull. Jard. Bot. Brux. 5:96. 1915.

Angola, Burundi, Cameroon, Congo, Malawi, Nigeria, Sudan, Tanzania, Uganda, Zambia, Zimbabwe.

Linzia glabra Steetz in Peters, Reise Mosamb. Bot. 353. 1864.

Vernonia glabra (Steetz) Vatke, Oesterr. Bot. Zeitschr. 27:194. 1877.

Vernonia obconica Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:286. 1877.

Vernonia pogosperma Klatt, Ann. K.K. Naturhist. Hofmus. 7:99. 1892.

Vernonia hindei S. Moore, J. Bot. 41: 155. 1903.

Vernonia piovanii Chiov., Racc. Bot. Miss. Cons. Kenya 61. 1935.

Vernonia roseopapposa Gilli, Ann. Naturhist. Mus. Wien 78:165. 1974.

Congo, Burundi, Kenya, Tanzania, south to Angola, Namibia, Mozambique, Transvaal, Swaziland, Natal, Madagascar.

Linzia infundibulariformis (Oliv. & Hiern in Oliv.) H. Rob., comb. nov. basionym: *Vernonia infundibulariformis* Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:285. 1877.

Vernonia saussureoides Hutch., Bull. Misc. Inf. Kew 1921:378. 1921.

Burundi, Congo, Cameroon, Nigeria, Sudan, Tanzania, Uganda.

Linzia ituriensis (Muschl.) H. Rob., comb. nov. basionym: *Vernonia ituriensis* Muschl., Wiss. Ergebn. Deutsch. Zent.-Afr. Exped. 1907–8 (2):364. 1911.

Vernonia hillii Hutch. & Dalz., Fl. W. Trop. Afr. ed. 1, 2:165, 168. 1931.

Vernonia muhiensis Kalanda, Bull. Jard. Bot. Nat. Belg. 52:125. 1982.

Burundi, Cameroon, Congo, Ethiopia, Nigeria, Rwanda, Sudan, Tanzania.

Linzia melleri (Oliv. & Hiern in Oliv.) H. Rob., comb. nov. basionym: *Vernonia melleri* Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:282. 1877.

Vernonia superba O. Hoffm., Engl. Pflanzenw. Ost-Afr. C. 406. 1895.

Vernonia scabrifolia O. Hoffm., Bot. Jahrb. Syst. 30:424. 1901, nom. illeg., not Hieron., 1897.

Vernonia paludigena S. Moore, J. Bot. 52:91. 1914.

Vernonia vanmeelii Lawalrée, Expl. Hydrobiol. Lac Tanganyika. Rés. Sc. 6, 2: 59. 1955, nom. nov. for *V. scabrifolia* O. Hoffm.

Angola, Congo, Malawi, Mozambique, Rwanda, Tanzania, Zambia, Zimbabwe.

Linzia vernonioides Sch. Bip. ex Walp., Rep. 2:948. 1843.

Vernonia quartiniana A. Rich., Tent. Fl. Abyss. 1:379. 1848.

Vernonia congolensis De Wild. & Muschl., Bull. Soc. Bot. Belg. 49:237. 1912.

Vernonia vernonioides (Sch. Bip. ex Walp.) Cufod., Bull. Jard. Bot. Brux. 36, suppl.:1078. 1966, hom. illeg., not (A. Gray) Bacigal, 1931.

Burundi, Congo, Ethiopia, Tanzania.

Linzia usafuensis (O. Hoffm.) H. Rob., comb. nov. basionym: *Vernonia usafuensis* O. Hoffm., Bot. Jahrb. Syst. 30:425. 1901.

Vernonia candelabricephala Gilli, Ann. Naturhist. Mus. Wien 78:161. 1974. Tanzania.

New Genera and New Combinations of Eastern Hemisphere Vernonieae Subtribe Gymnantheminae H. Rob.

Distephanus Cass., Bull. Soc. Philom. Paris 1817. 151. 1817. Type: *Conyza populiifolia* Lam.

The genus characterization, synonymy, and many of the species are given by Robinson & Kahn (1986), who stressed the yellow flowers and trinervate leaves as important generic characteristics. The type species has been redescribed and illustrated particularly well by Hind (1996), and it is suggested in Scott (1993) and Hind (1996) that the number of species in the genus should be nearer to 40 instead of the 26 transferred by Robinson & Kahn (1986). During the present study only the following single additional species is transferred.

Distephanus henryi (Dunn.) H. Rob., comb. nov. basionym: *Vernonia henryi* Dunn., J. Linn. Soc. Bot. 35:500. 1903. China.

Gymnanthemum Cass., Bull. Soc. Philom. Paris 1817:10. 1817. Type: *G. cupulare* Cass. = *Baccharis senegalensis* = *Gymnanthemum coloratum* (Willd.) H. Rob. & BKahn

Bracheilema R. Br. ex Salt., Abyss. Append. 65. 1814, nom. nud.

Decaneurum DC., Arch. Bot. (Paris) 2: 516. 1833, nom. superfl. Type: as in *Gymnanthemum*.

Monosis DC. in Wight, Contrib. Bot. Ind. 5. 1834. Type: *Monosis wightiana* DC. in Wight [= *Vernonia arborea* Buch.-Ham.].

Vernonia sect. *Strobocalyx* Blume ex DC., Prodr. 5:21. 1836. Type: *Vernonia arborea* Buch.-Ham.

Plectreca Rafin., Fl. Tellur. 4:119. 1838 ("1836"). Type: *Staehelina corymbosa* Thunb.

Keringa Rafin., Sylva Tellur. 144. 1838. Type: *Vernonia amygdalina* Del.

Cheliusia Sch. Bip., Flora 24, 1. Intell. 26. 1841. Type: *Cheliusia abyssinica* Sch. Bip. = *Gymnanthemum amygdalinum* (Del.) Sch. Bip. ex Walp.

Strobocalyx (Bl. ex DC.) Spach, Hist. Nat. Veg. Phan. 10:39. 1841.

Punduana Steetz in Peters, Reise Mosamb. Bot. 345. 1864. Type: *P. volkameriifolia* (DC.) Steetz

Vernonia subsect. *Urceolata* S. B. Jones, *Rhodora* 83:67. 1981. Type: *Vernonia sphaerocalyx* O. Hoffm.

Shrubs or trees, moderately to densely branching; hairs often forming felt, with large often contorted cap cells basally or nearly basally attached. Leaves alternate, with short or winged petioles to rather long-petiolate. Inflorescences terminal on stems and branches, densely corymbiform. Heads with involucre campanulate to ovoid; bracts appressed, coriaceous to subcoriaceous, 25–35 in 4–5 series, inner bracts persistent or easily deciduous; receptacle epaleaceous. Florets 1–50; corollas white to violet; tube cylindrical, throat longer than thecae or very deeply cut, lobes with glands or spicules; anther base broadly tailed, often long; apical anther appendages glabrous, with rather thick-walled cells; style with or without node. Achenes 5–10-costate, with or without setulae or uniseriate hairs, raphids short to elongate or lacking; pappus of many rather persistent capillary bristles, often broad-tipped, with short outer squamellae. Pollen grains tricolporate, non-lophate or rarely lophate, echinate, micropunctate. Chromosome numbers $N = 7?$, 10, 20, $2N = 30$ (Jones 1979, 1982). Sesquiterpene lactones include elemanolides (Bohlmann & Jakupovic 1990).

A broad interpretation of the *Gymnanthemum* is accepted here. The type species lacks a basal node on the style, but other closely related species have such nodes. The number of ribs on the achene varies from 5 to 10 within many subgroups. At least some of the species with persistent inner involucre bracts seem very closely related to species in which they are deciduous. The leaves also seem to vary in size, texture and margin. The corolla throat is usually long, but a number of species in Madagascar have sinuses cut nearly to the base of the throat. The corolla lobes usually show a characteristic long-triangular erect form, but a few species have long narrow lobes that are rolled back with age. The sweeping hairs are usually blunt, but those of

G. amygdalinum are more pointed. The pollen is almost always non-lophate or Type A, but rarely, as in the type of *Punduana*, *Vernonia volkammeriaefolia*, the pollen is lophate. The genus is limited within the subtribe in the present paper by only the most obvious differences in inflorescence shape, involucre bracts, leaf nervation, corolla symmetry and color, and lack of pales on the receptacle.

The genus is credited here with the following 43 species:

Gymnanthemum amygdalinum (Del.) Sch. Bip. ex Walp., Rep. 2:948. 1843.

Vernonia amygdalina Del., Cent. Pl. Afr. Voy. Méroé 41. 1826.

Gymnanthemum abyssinicum Sch. Bip. ex Walp., Rep. 2:948. 1843.

Vernonia vogeliana Benth. in Hook., Niger Fl. 427. 1849.

Vernonia condensata Baker., J. Bot. 8: 202. 1875.

Vernonia eritreana Klatt, Bull. Herb. Boiss. 4:826. 1896.

Vernonia randii S. Moore, J. Bot. 37:369. 1899.

Vernonia giorgii De Wild., Bull. Jard. Bot. Brux. 5:92. 1915.

Vernonia bahiensis Toledo, Arq. Bot. Estado Sao Paulo, n.s. 1:52. 1939.

Vernonanthura condensata (Baker) H. Rob., Phytologia 73:69. 1992.

Yemen and Ethiopia, South Uganda, Kenya and Tanzania, Brazil, widely cultivated.

Gymnanthemum anceps (C. B. Clarke ex Hook.f.) H. Rob., comb. nov. basionym: *Vernonia anceps* C. B. Clarke ex Hook. f., Fl. Brit. Ind. 3:233. 1881. Sri Lanka.

Gymnanthemum andersonii (C. B. Clarke) H. Rob., comb. nov. basionym: *Vernonia andersonii* C. B. Clarke, Comp. Ind. 27. 1852.

Vernonia chevalieri Gagnap., Bull. Mus. Hist. Nat. Paris 25:488. 1919, hom. illeg., not O. Hoffm., 1908. Assam, Myanmar, China.

- Gymnanthemum andrangovalense* (Humbert) H. Rob., comb. nov. basionym: *Vernonia andrangovalensis* Humbert, Notul. Syst. (Paris) 13:311. 1948.
Madagascar.
- Gymnanthemum antanalus* (Humbert) H. Rob., comb. nov. basionym: *Vernonia antanala* Humbert, Notul. Syst. (Paris) 13:314. 1948, in part., emend., Humbert, Not. Syst. (Paris). 15:361. 1959.
Madagascar.
- Gymnanthemum appendiculatum* (Less.) H. Rob., comb. nov. basionym: *Vernonia appendiculata* Less., Linnaea 6:636. 1831.
Madagascar.
- Gymnanthemum arboreum* (Buch.-Ham.) H. Rob., comb. nov. basionym: *Vernonia arborea* Buch.-Ham., Trans. Linn. Soc. London 14:218. 1824.
- Monosis wightiana* DC. in Wight, Contrib. Bot. Ind. 5. 1834, not *Vernonia wightiana* Arn.
- Vernonia celebrica* DC., Prodr. 5:21. 1836.
- Vernonia javanica* DC., Prodr. 5:22. 1836.
- Vernonia blumeana* DC., Prodr. 5:22. 1836.
- Strobocalyx arborea* (Buch.-Ham.) Sch. Bip., Jahres. Pollichia 18–19:171. 1861.
- Vernonia monosis* Benth. ex C. B. Clarke, Comp. Ind. 24. 1852, nom. nov. for *Monosis wightiana* DC. in Wight, 1834.
- Vernonia vaniotii* Lévl., Repert. Spec. Nov. Regni Veg. 12:531. 1913.
SE. Asia, Indonesia.
- Gymnanthemum baronii* (Baker) H. Rob., comb. nov. basionym: *Vernonia baronii* Baker, J. Linn. Soc. Bot. 20:173. 1885.
- Vernonia campenoni* Drake, Bull. Soc. Bot. France 46:241. 1899.
Madagascar.
- Gymnanthemum bellinghamii* (S. Moore) H. Rob., comb. nov. basionym: *Vernonia bellinghamii* S. Moore, J. Bot. 38:155. May 1900.
- Vernonia goetzeana* O. Hoffm., Bot. Jahrb. Syst. 28:503. July 1900.
- Vernonia elizabethvilleana* De Wild., Repert. Spec. Nov. Regni Veg. 13:20. 1941.
Congo and Tanzania south to Mozambique.
- Gymnanthemum bockianum* (Diels) H. Rob., comb. nov. basionym: *Vernonia bockiana* Diels, Bot. Jahrb. Syst. 29:608. 1900.
- Pluchea rubicunda* Schneid. in Sarg., pl. Wils. 3:418. 1916. China.
- Gymnanthemum chapelieri* (Drake) H. Rob., comb. nov. basionym: *Vernonia chapelieri* Drake, Bull. Soc. Bot. France 46:234. 1899.
Madagascar.
- Gymnanthemum coloratum* (Willd.) H. Rob. & B. Kahn, Proc. Biol. Soc. Wash. 99:501. 1986.
- Eupatorium coloratum* Willd., Sp. Pl. 3: 1768. 1803.
- Baccharis senegalensis* Pers., Syn. Pl. 2: 424. 1807.
- Gymnanthemum cupulare* Cass., Dict. Sc. Nat., ed. 2, 20: 109. 1821.
- Vernonia senegalensis* (Pers.) Less., Linnaea 4:265. 1829.
- Decaneurum grande* DC., Prodr. 5:67. 1836.
- Decaneurum senegalense* (Pers.) DC., Prodr. 5:68. 1836.
- Gymnanthemum grande* (DC.) Sch. Bip. ex Walp., Rep. 2:948. 1843.
- Gymnanthemum senegalense* (Pers.) Sch. Bip. ex Walp., Rep. 2:948. 1843.
- Gymnanthemum quercifolium* Steetz in Peters, Reise Mossamb. Bot. 334. 1864.
- Vernonia oxyura* O. Hoffm., Engl. Pflanzenw. Ost.-Afr. C. 403. 1895.
- Vernonia polyura* O. Hoffm., Bot. Jahrb. Syst. 30:422. 1901.

- Vernonia cirrhifera* S. Moore, J. Linn. Soc. Bot. 35:320. 1902.
- Vernonia longipetiolata* Muschl., Bot. Jahrb. Syst. 46:74. 1911.
- Vernonia aldabrensis* Hemsl., J. Bot. 54, suppl. 2:20. 1916.
- Vernonia grandis* (DC.) Humb., Fl. Madagascar. 189:44. 1960.
West tropical Africa east to Kenya, south to Mozambique and Madagascar.
- Gymnanthemum corymbosum*** (Thunb.) H. Rob., comb. nov. basionym: *Staehelina corymbosa* Thunb., Prodr. pl. Cap. 2:143. 1800.
- Vernonia corymbosa* (Thunb.) Less., Linnaea 6:647. 1831.
- Plectreca corymbosa* (Thunb.) Rafin., Fl. Tellur. 4:119. 1838 ("1836").
South Africa.
- Gymnanthemum coursii*** (Humbert) H. Rob., comb. nov. basionym: *Vernonia coursii* Humbert, Notul. Syst. (Paris) 13:310. 1948.
Madagascar.
- Gymnanthemum crataegifolium*** (Hutch.) H. Rob., comb. nov. basionym: *Vernonia crataegifolia* Hutch., Bull. Misc. Inf. Kew 7:330. 1912.
South Africa.
- Gymnanthemum cumingianum*** (Benth. in Hook.f.) H. Rob., comb. nov. basionym: *Vernonia cumingiana* Benth., Hooker's J. Bot. Kew Gard. Misc. 4:232. 1852.
China, Philippines.
- Gymnanthemum cylindriceps*** (C. B. Clarke) H. Rob., comb. nov. basionym: *Vernonia cylindriceps* C. B. Clarke, J. Linn. Soc. Bot. 25:35. 1880.
India, Nepal.
- Gymnanthemum dissolutum*** (Baker) H. Rob., comb. nov. basionym: *Vernonia dissoluta* Baker, J. Linn. Soc. Bot. 20:174. 1883.
- Vernonia sparsiflora* Baker, J. Linn. Soc. Bot. 20:172. 1883.
- Vernonia capreaefolia* Baker, J. Linn. Soc. Bot. 22:487. 1887.
Madagascar.
- Gymnanthemum esculentum*** (Hemsl. ex F. B. Forbes & Hemsl.) H. Rob., comb. nov. basionym: *Vernonia esculenta* Hemsl. ex F. B. Forbes & Hemsl., J. Linn. Soc. Bot. 23:401. 1888.
- Vernonia papillosa* Franch., J. Bot. 10:368. 1896.
- Vernonia arbor* Lévl., Repert. Spec. Nov. Regni Veg. 11:304. 1912.
China.
- Gymnanthemum exsertiflorum*** (Baker) H. Rob., comb. nov. basionym: *Vernonia exsertiflora* Baker, Bull. Misc. Inf. Kew 1898:147. July 1898.
- Vernonia kreismannii* Welw. ex Hiern, Cat. Afr. Pl. Welw. 1, 3:517. Dec 1898.
- Vernonia sphaerocalyx* O. Hoffm., Bot. Jahrb. Syst. 30:423. 1901.
Angola and Congo to Malawi and Tanzania.
- Gymnanthemum exsertum*** (Baker) H. Rob., comb. nov. basionym: *Vernonia exserta* Baker, J. Linn. Soc. Bot. 22:488. 1887.
- Vernonia grisea* Baker, J. Linn. Soc. Bot. 22:488. 1887, hom. illeg., not Baker, 1873.
- Vernonia trichodesma* Baker, J. Linn. Soc. Bot. 25:325. 1890.
- Vernonia lantziana* Drake, Bull. Soc. Bot. France 46:235. 1899.
Madagascar.
- Gymnanthemum glaberrimum*** (Welw. ex O. Hoffm.) H. Rob., comb. nov. basionym: *Vernonia glaberrima* Welw. ex O. Hoffm., Bol. Soc. Brot. 13:15. Sept 1896.
- Vernonia hensii* Klatt, Bull. Herb. Boiss. 4:828. Dec. 1896.
- Vernonia mashonica* N. E. Br., Bull. Misc. Inf. Kew 1906:108. 1906.
West, central and south tropical Africa north to Sudan.
- Gymnanthemum hildebrandtii*** (Vatke) H.

- Rob., comb. nov. basionym: *Vernonia hildebrandtii* Vatke, Osterr. Bot. Zeit. 25: 323. 1875.
- Vernonia taylorii* S. Moore, J. Bot. 38: 154. 1900.
Kenya, Somalia, Tanzania.
- Gymnanthemum humblotii*** (Drake) H. Rob., comb. nov. basionym: *Vernonia humblotii* Drake, Bull. Soc. Bot. France 46:235. 1899.
- Vernonia beforonensis* Humbert, Notul. Syst. (Paris) 13:320. 1948.
Madagascar.
- Gymnanthemum louvelii*** (Humbert) H. Rob., comb. nov. basionym: *Vernonia louvelii* Humbert, Notul. Syst. (Paris) 15: 247. 1958.
Madagascar.
- Gymnanthemum mespilifolium*** (Less.) H. Rob., comb. nov. basionym: *Vernonia mespilifolia* Less., Linnaea 6:641. 1831.
South Africa.
- Gymnanthemum myrianthum*** (Hook.f.) H. Rob., comb. nov. basionym: *Vernonia myriantha* Hook.f., J. Linn. Soc. Bot. 7: 198. 1864.
- Vernonia podocoma* Sch. Bip. ex Vatke, Linnaea 39:476. 1875.
- Vernonia subuligera* O. Hoffm., Engl., Pflanzenw. Ost.-Afr. C. 403. 1895.
- Vernonia stipulacea* Klatt, Bull. Herb. Boiss. 4:457. 1896.
- Vernonia lujae* De Wild., Pl. Nov. Herb. Hort. Then. 2:119, t. 96. 1900.
- Vernonia ampla* O. Hoffm., Bot. Jahrb. Syst. 30:423. 1901.
- Vernonia myrianthoides* Muschl., Bot. Jahrb. Syst. 46:84. 1911.
- Vernonia uhligii* Muschl., Bot. Jahrb. Syst. 46:79. 1911.
- Vernonia oliveriana* Pichi-Serm., Webbia 7:345. 1950, nom. illegit. superfl. for *V. podocoma* Sch. Bip. ex Vatke.
- Vernonia chlarugii* Pich-Serm., Miss. Stud. Lago Tana 7, Ricerche Bot. 1: 155, t. 30. 1951.
West Africa from Guinea and Sierra Leone to Cameroon, Congo, Sudan, Ethiopia, Kenya, Tanzania, Uganda to south tropical Africa.
- Gymnanthemum obovatum*** Gaudich., Voy. Uran. Bot. 471. 1830.
- Vernonia cuneata* Less., Linnaea 6:644. 1831.
- Vernonia vagans* DC., Prodr. 5:32. 1836.
- Vernonia scandens* DC., Prodr. 5:32. 1836.
- Decaneurum obovatum* (Gaudich.) DC., Prodr. 5:67. 1836.
- Gymnanthemum scandens* (DC.) Steetz in Peters, Reise Mossamb. Bot. 338. 1864.
- Gymnanthemum vagans* (DC.) Steetz in Peters, Reise Mossamb. Bot. 338. 1864.
- Gymnanthemum affine* Steetz in Peters, Reise Mossamb. Bot. 338. 1864.
- Vernonia obovata* (Gaudich.) Boerl., Handl. Fl. Ned. Indië 2:1. 1891, not *Vernonia obovata* Less., 1829.
India, Myanmar, Indonesia.
- Gymnanthemum pectiniforme*** (DC. in Wight) H. Rob., comb. nov. basionym: *Vernonia pectiniformis* DC. in Wight, Contr. Bot. Ind. 2. 1834.
- Vernonia puncticulata* DC., 7:264. 1838.
- Lysistemma pectiniforme* (DC. in Wight) Steetz in Peters, Reise Mossamb. Bot. 343. 1864.
India, Sri Lanka.
- Gymnanthemum pectorale*** (Baker) H. Rob., comb. nov. basionym: *Vernonia pectoralis* Baker, J. Bot. 20:139. 1882.
Madagascar.
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Madagascar.
- Gymnanthemum rueppellii*** (Sch. Bip. ex Walp.) H. Rob., comb. nov. basionym: *Vernonia rueppellii* Sch. Bip. ex Walp., Rep. 2:946. 1864.
- Vernonia francavillana* Oliv. & Hiern in

Oliv., Fl Trop. Afr. 3:296. 1877.
Ethiopia.

Gymnanthemum secundifolium (Boj. ex DC.) H. Rob., comb. nov. basionym: *Vernonia secundifolia* Boj. ex DC., Prodr. 5: 22. 1836.

Vernonia quadriflora Baker, J. Linn. Soc. Bot. 20:173. 1884.
Madagascar.

Gymnanthemum solanifolium (Benth.) H. Rob., comb. nov. basionym: *Vernonia solanifolia* Benth., Hooker's J. Bot. Kew Gard. Misc. 1:486. 1842.
China, Myanmar, Thailand, Vietnam.

Gymnanthemum subcrassulescens (Humbert) H. Rob., comb. nov. basionym: *Vernonia subcrassulescens* Humbert, Notul. Syst. (Paris) 13:309. 1948.
Madagascar.

Gymnanthemum theophrastifolium (Schweinf. ex Oliv. & Hiern) H. Rob., comb. nov. basionym: *Vernonia theophrastifolia* Schweinf. ex Oliv. & Hiern, in Oliv., Fl. Trop. Afr. 3:294. 1877.

Vernonia myriocephala A. Rich., Tent. Fl. Abyss. 1:374. 1848, hom. illeg., not DC., 1836.

Cacalia richardiana O. Kuntze, Rev. Gen. Pl. 2:969. 1891, nom. nov. for *V. myriocephala* A. Rich.

Vernonia seretii De Wild., Ann. Mus. Congo V, 11:207. 1907.

Vernonia macrophylla Chiov., Ann. Bot. Roma 9:70. 1911.

Vernonia richardiana (O. Kuntze) Pich-Serm., Webbia 7:340. 1950.
Congo and Nigeria east to Uganda, Kenya and Ethiopia.

Gymnanthemum thomsonianum (Oliv. & Hiern in Oliv.) H. Rob., comb. nov. basionym: *Vernonia thomsoniana* Oliv. & Hiern in Oliv., Trans. Linn. Soc. London 29:91. 1873.

Vernonia livingstoniana Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:295. 1877.

Vernonia cruda Klatt, Bull. Herb. Boiss. 4:456. 1896.

Vernonia densicapitulata De Wild., Bull. Jard. Bot. Brux. 5:92. 1915.

West, central and south tropical Africa.

Gymnanthemum urticifolium (A. Rich.) H. Rob., comb. nov. basionym: *Vernonia urticifolia* A. Rich., Tent. Fl. Abyss. 1:378. 1848.

Vernonia antinoriana Avetta, Nouv. Giorn. Bot. Ital. 21:348. 1889.

Vernonia mellifera Muschl., Bot. Jahrb. Syst. 46:90. 1911.

Congo, Ethiopia, Kenya.

Gymnanthemum vidalii (G. Merr.) H. Rob., comb. nov. basionym: *Vernonia vidalii* G. Merr., Philipp. Is., Bur. Gov. Lab. Bull. 6:6. 1904 ("1903").
Philippines.

Gymnanthemum volkameriifolium (DC.) H. Rob., comb. nov. basionym: *Vernonia volkammeriaefolia* DC., Prodr. 5:32. 1836.

Vernonia acuminata DC., Prodr. 5:32. 1836.

Vernonia punduana DC., Prodr. 5:32. 1836.

Vernonia esqirolii Lévl., Repert. Spec. Nov. Regni Veg. 11:304. 1912.
China, India, Myanmar.

Gymnanthemum wightianum (Arn.) H. Rob., comb. nov. basionym: *Vernonia wightiana* Arn., Pugill. pl. Ind. Or. 27. 1836.
Sri Lanka.

Gymnanthemum zanzibarensis (Less.) H. Rob., comb. nov. basionym: *Vernonia zanzibarensis* Less., Linnaea 6:637. 1831.
Kenya, Tanzania.

Gymnanthemum zeylanicum (L.) H. Rob., comb. nov. basionym: *Eupatorium zeylanicum* L., Sp. pl. 837. 1753.

Vernonia zeylanica (L.) Less., Linnaea 4: 344. 1829.
Sri Lanka.

A number of additional species have been placed in the genus that are excluded here. These include *G. congestum* Cass., = *Critoniopsis triflosculosa* (H. B.

K.) H. Rob. (Robinson 1993), *G. frutescens* (Bl.) Sch. Bip. ex Walp., *G. molle* (DC.) Sch. Bip. ex Walp., *G. phyllolaenum* (DC.) Sch. Bip. ex Walp. and *G. reticulatum* (Wight) Sch. Bip. ex Walp. which belong to *Phyllocephalum* (Kirkman 1981).

Brenandendron H. Rob., gen. nov. (Gymnantheminae).

Type: *Vernonia titanophylla* Brenan

Plantae arborescentes ad 8 m altae mediocriter ramosae; caules velutini, pilis fusiformibus vel leniter asymmetricis. Folia alterna petiolata vel sessilia, laminis magnis interdum lobatis. Inflorescentiae frondiformes in ramulis racemosae vel spiciformes. Capitula sessilia vel breviter pedunculata; involucria campanulata; bractae involucri usque ad 110 in seriebus 7–9 apressae interiores leniter deciduae subcoriaceae vel coriaceae; receptacula epaleacea. Flores 30–50 in capitulo; corollae plerumque tubiformes in faucibus elongatae, lobis erectis vel interdum recurvatis; thecae antherarum base longe obtuse caudatae; appendices apicales in parietibus cellularum firmae; basi stylorum annulate noduliferi. Achenia 8–10-costata glabra idioblastifera, raphidis rhomboideis breviter vel mediocriter elongatis; setae pappi interiores subplanae subsistentes exteriores squamiformes vel nullae. Grana pollinis tricolporata echinata non lophata. Numerus chromosomatum $N = 9$ Mangenot & Mangenot (1957).

Germacranolides have been reported from the genus (Bohlmann and Jakupovic 1990).

Brenandendron is closely related to *Gymnanthemum*, but it differs by the distinctive frondiform inflorescence. Brenan (1953) provided a key to the three species. In addition to the differences given by Brenan, the three species differ in their corolla lobes. *Brenandendron donianum* has erect lobes much shorter than the corolla throat, *B. frondosum* has narrow erect lobes, and *B. titanophyllum* has strongly recurved narrow lobes.

The three species are as follows:

Brenandendron donianum (DC.) H. Rob., comb. nov. basionym: *Vernonia doniana* DC., Prodr. 5:23. 1836.

Vernonia conferta Benth. in Hook., Niger Fl. 427. 1849.

West and central tropical Africa from Angola to Liberia and Sudan.

Brenandendron frondosum (Oliv. & Hiern in Oliv.) H. Rob., comb. nov. basionym: *Vernonia frondosa* Oliv. & Hiern in Oliv., Fl. Trop. Afr. 3:294. 1877.

West Africa from Guinea to Cameroon.

Brenandendron titanophyllum (Brenan) H. Rob., comb. nov. basionym: *Vernonia titanophylla* Brenan, Kew Bull. 1953:116. 1953.

Cameroon, Congo, Equatorial Guinea.

Myanmaria H. Rob., gen. nov. (Gymnantheminae).

Type: *Vernonia calycina* DC.

Plantae frutescentes ca. 1 m altae mediocriter ramosae; caules puberuli, pilis simplicibus uniseriatis multiseptatis. Folia alterna breviter petiolata, laminis oblongo-ovatis apice obtusis. Inflorescentiae corymbiformae. Capitula in ramis terminalia pedunculata; bractae involucri exteriores ca. 20 ca. 2–3-seriatae late ovatae virides foliiformes; bractae interiores lineares acutae; receptacula epaleacea. Flores 35–50 in capitulo; corollae puberulae, tubis elongatis, faucibus quoad lobis longioribus, lobis 2–3-plo longioribus quam latioribus extus glanduliferis et pauca breviter pilosulis; thecae antherarum base distincte late caudatae; appendices apicales antherarum distincte induratae; basi stylorum non noduliferi; rami stylorum obtuse papilliferi. Achenia 10-costata idioblastifera in costis setulifera, raphidis subquadratis; setae pappi barbellatae numerosae 2–3-seriatae persistentes exteriores breviores vel nullae. Grana pollinia ca. 50 μm in diametro tricolporata echinata lophata micropunctata, lacunis polaribus triplicibus intercolpatis.

Myanmaria is endemic to Myanmar. The genus is easily distinguished by the ca. 20

large, broad, green outer involucre bracts that completely conceal the inner bracts. The species is often described as herbaceous, and it apparently commonly turns black when dry.

The single known species is as follows:

Myanmaria calycina (DC.) H. Rob., comb. nov. basionym: *Vernonia calycina* DC., Prodr. 5:60. 1836.

Myanmar.

Lampropappus (O. Hoffm.) H. Rob., stat. nov. (Gymnantheminae). *Vernonia* section *Lampropappus* O. Hoffm., Bol. Soc. Broter. 13:14. 1896. Type: *Vernonia lampropappus* O. Hoffm. *Vernonia* subsect. *Turbinella* S. B. Jones, Rhodora 83:67. 1981. Type: *Vernonia lampropappus* O. Hoffm.

Subshrubs to 0.6 m high; stems costate, tomentose, hairs with basally or slightly excentrically attached contorted capcells. Leaves alternate, shortly petiolate to more or less amplexicaul, blades densely tomentose abaxially. Inflorescence densely corymbose, with many heads. Heads hemispherical to turbinate; involucre bracts ca. 30, ca. 4–5-seriate, strongly gradate, outer bracts ovate, apices acute to shortly apiculate; receptacle epaleaceous. Flowers ca. 20 in a head; corollas white with purple tips to pale purple, actinomorphic or slightly zygomorphic, with lobe or sinus centered on outer side, longest lobe centered toward inside. Bases of anther thecae rounded, without tails; apical appendage with somewhat thickened and ornamented cell walls; base of style with broadened node; sweeping hairs of style branches with obtuse tips. Achenes 5-costate, densely villous with uniseriate hairs, with few septae near base, with few idioblasts; raphids subquadrate to short-oblong; pappus setae persistent, 3-seriate, broad and flat, densely scabrid on margins smooth on surfaces, outer segments shorter and narrower. Pollen grains tricolporate, non-lophate, echinate.

Lampropappus, as a section, was originally compared with the American *Stilpnopappus* Mart. ex DC. and the Eastern

Hemisphere *Vernonia* sect. *Stengelina* (= *Baccharoides* Moench) by Hoffmann (1896) because of the broad flat pappus segments, but was distinguished at least from the *Vernonia* sect. *Stengelina* by the exapendiculate involucre bracts. *Lampropappus* does not have the subulate tips on the pappus elements seen in *Stilpnopappus*. The African genus is further distinguished by the uniseriate rather than biseriate hairs densely covering the achene and by the non-lophate pollen. One species of the present genus, *L. turbinella*, proves to be distinct in the slightly zygomorphic corollas that are rotated or resupinate by 1/10 so that a sinus is centered to the outside and a lobe centered to the inside. This is not seen in the other two species of the genus. This feature occurs elsewhere in the Vernonieae in the American genus *Mattfeldanthus* H. Rob. & R. M. King (1979), which also has zygomorphic corollas. The latter genus is related to *Lepidaploa* (Cass.) Cass. with lophate pollen and seriate-cymose inflorescences. Such resupination of the corolla also seems to occur in the *Gorteriinae* of the *Arctoteae*.

The following three species are placed in the genus:

Lampropappus eremanthifolia (O. Hoffm.) H. Rob., comb. nov. basionym: *Vernonia eremanthifolia* O. Hoffm., Bol. Soc. Broter. 13:15. 1896.

Angola.

Lampropappus hoffmannii H. Rob., nom. nov. basionym: *Vernonia lampropappus* O. Hoffm., Bol. Soc. Broter. 13:14. 1896.

Angola.

Lampropappus turbinellus (S. Moore) H. Rob., comb. nov. basionym: *Vernonia turbinella* S. Moore, J. Linn. Soc. Bot. 47:266. 1925.

Congo, Malawi, Zambia. Zygomorphy of the corollas is not mentioned in the original description of the species (Moore 1925).

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